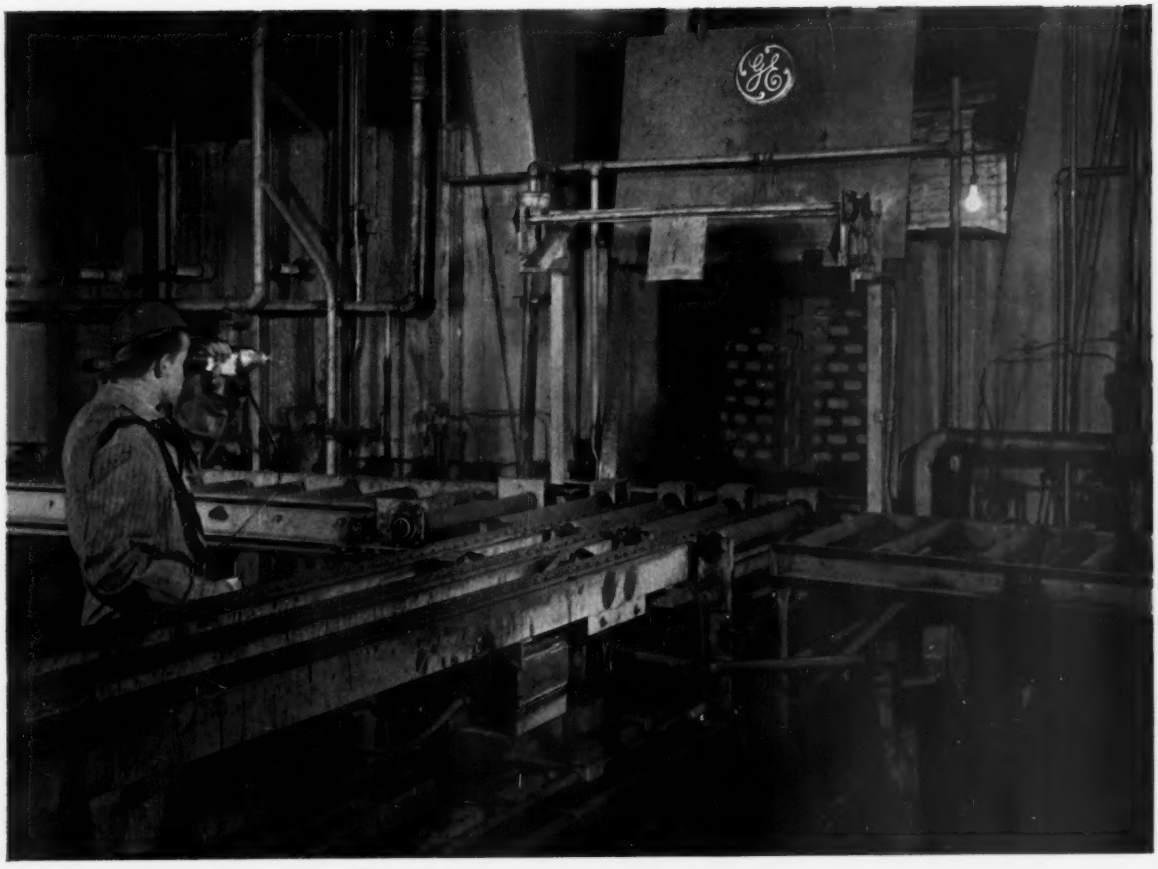
MAY 1959

FOUNDRY

A PENTON PUBLICATION



Heat Treating Automatically

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AFS Castings Congress and Show

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The automotive industry is the world's largest consumer of gray iron and malleable iron castings. In 1958, 1,427,000 net tons of gray iron and 300,000 net tons of malleable iron were cast for some 5,000,000 passenger cars, trucks and buses. In 1959 this figure may exceed 6,000,000 *in passenger cars alone.* This gigantic industry is a prime user of FERROCARBO briquettes, the exclusive patented cupola additive by Carborundum. FERROCARBO results in finer-grained, denser, and stronger castings required by today's high-powered vehicles. FERROCARBO-treated castings are more machinable thus lowering manufacturing costs. See that FERROCARBO is in your production picture for *premium* castings at *no extra cost.*

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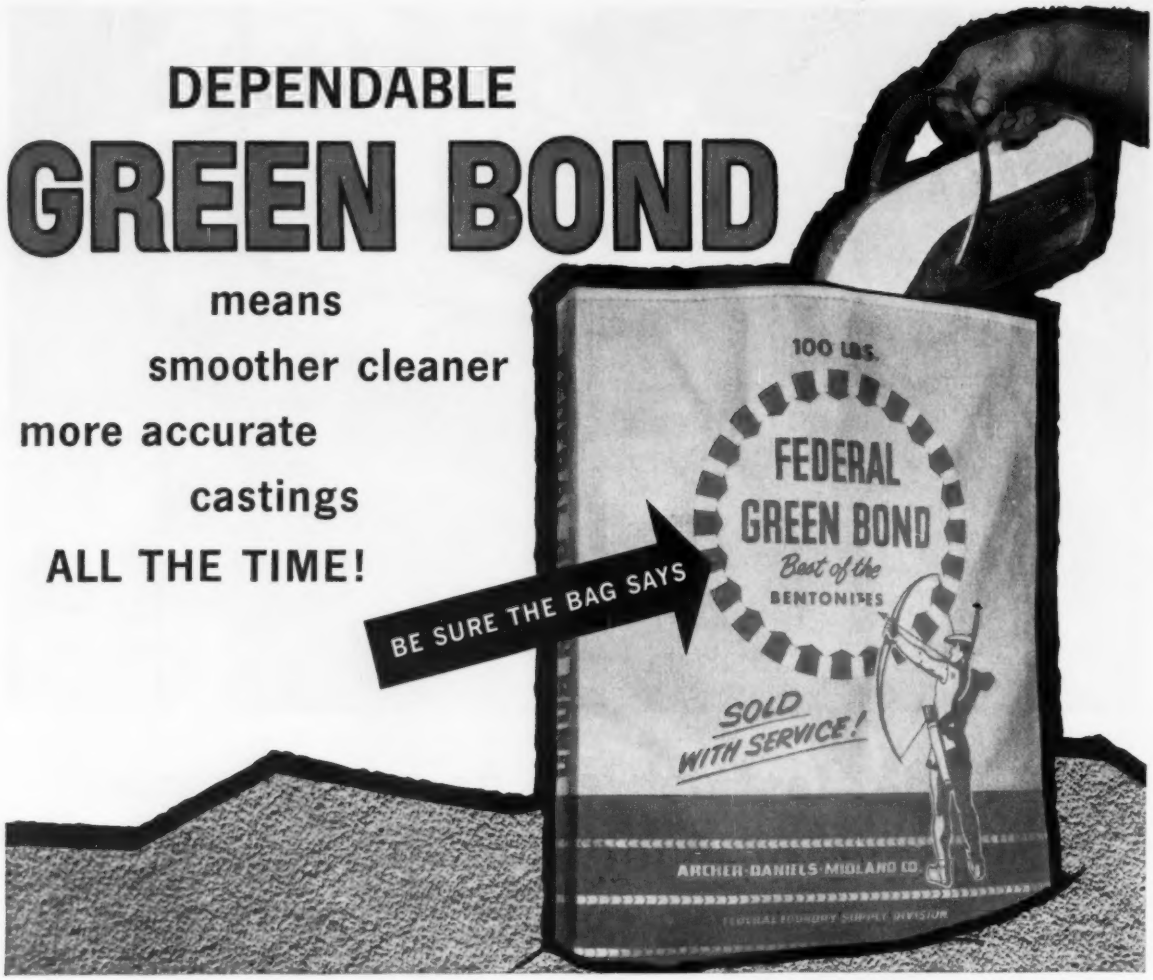
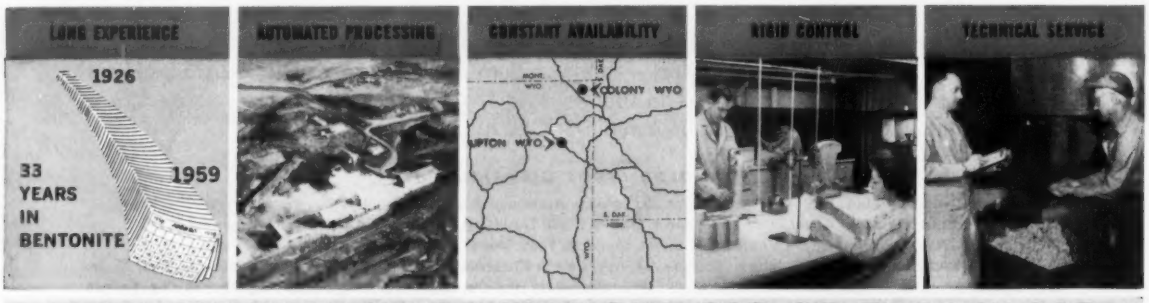


5 Good reasons why foundries rely on GREEN BOND



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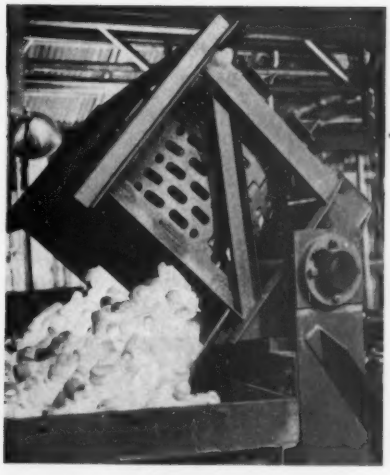

You can almost feel the heat from these malleable iron castings as they are being dumped after annealing. This is one of the automatic operations at the new heat treating installation of Marion Malleable Iron Works, Marion, Ind. The story starts on Page 82.

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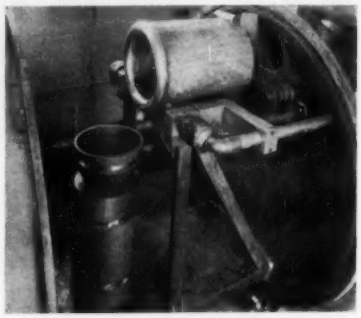
EDITORIAL OFFICES: Penton Building, Cleveland 13, Ohio. Main 1-8260. Branch Offices: New York, Detroit, Chicago, Pittsburgh, Washington, London.

FOUNDRY is edited primarily for management, production, technical, and purchasing personnel in foundries. A copy is sent at no cost to each metal casting plant in the U. S. and Canada employing 20 or more workers and to selected smaller foundries. Additional copies are sent to each foundry to the extent necessary to serve all key foundry personnel on a personal or routed basis. A limited number of copies is supplied at no cost to educational institutions. Subscriptions in the U. S., possessions, and Canada for home-addressed copies and copies not qualified for under the above principles: One year, $10. Single copy, $1. Other countries: One year, $20. Single copy, $2. Published monthly and copyright 1959 by The Penton Publishing Co., Penton Building, Cleveland 13, Ohio. Accepted as controlled circulation publication at Cleveland, Ohio.

THE EDITORS' WORKSHOP

TITANIUM: Melting and casting of titanium presents problems not encountered in handling more conventional metals. This view shows a skull furnace crucible in tilted po-



sition for casting titanium into a graphite mold at Naval Research Laboratory, Washington. The considerable research work done at NRL on titanium will be the subject of an article coming soon.

COMING UP: Subjects of other articles scheduled for coming months will include testing of steel foundry sands, how to achieve soundness in nonferrous castings, thermocouple use in the ferrous foundry, casting in ceramic molds, and several topics of particular interest to foundry management.

INSPECTION: Various methods are used to check the automotive crankshafts *cast* (see Page 10) by Central Foundry Div., GMC, at its

Danville, Ill., plant (see Page 150). Shown here are crankshafts being prepared for radiographic inspection. The Cobalt 60 unit is used to determine the gating and to check castings for internal soundness.

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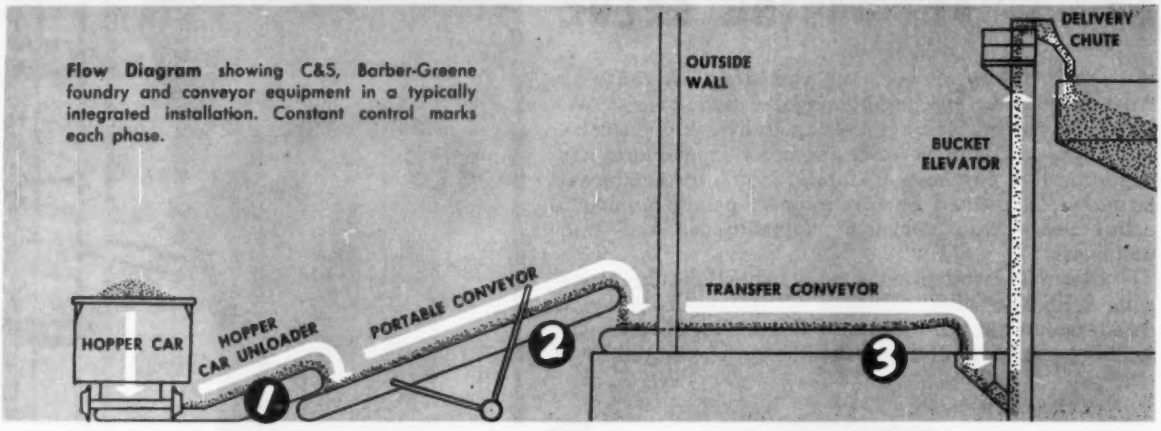

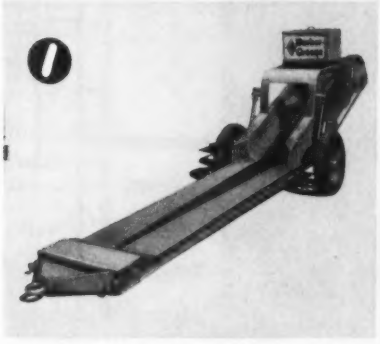

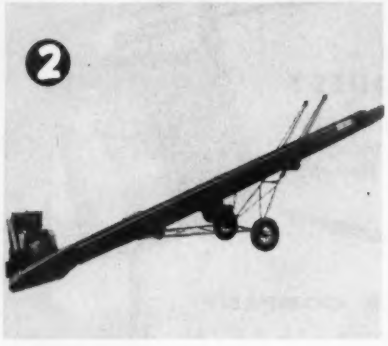

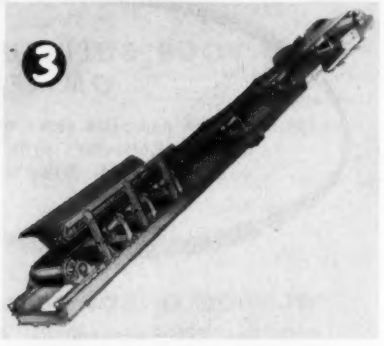

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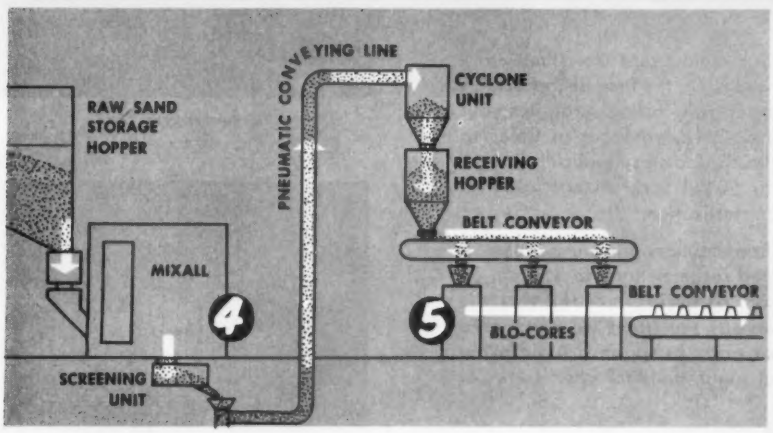

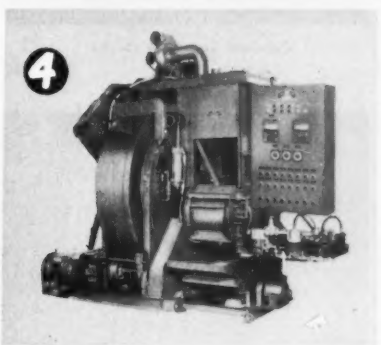

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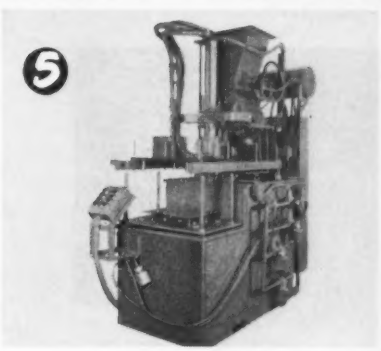

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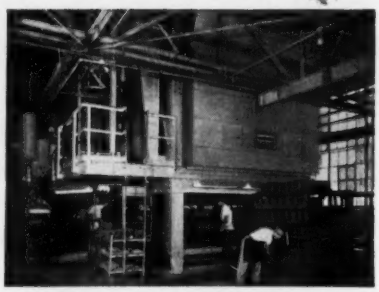

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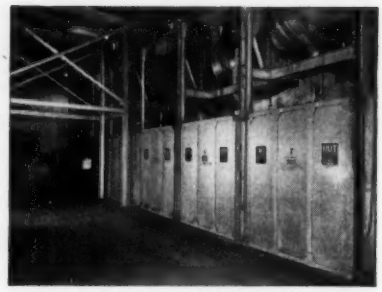

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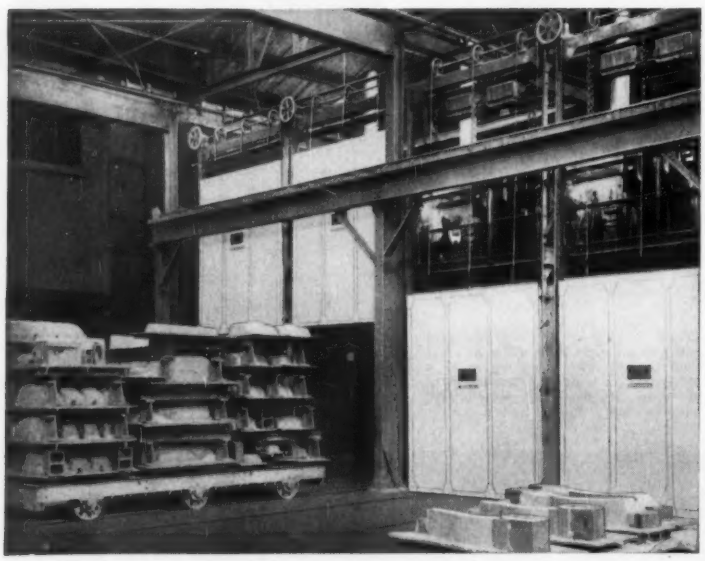

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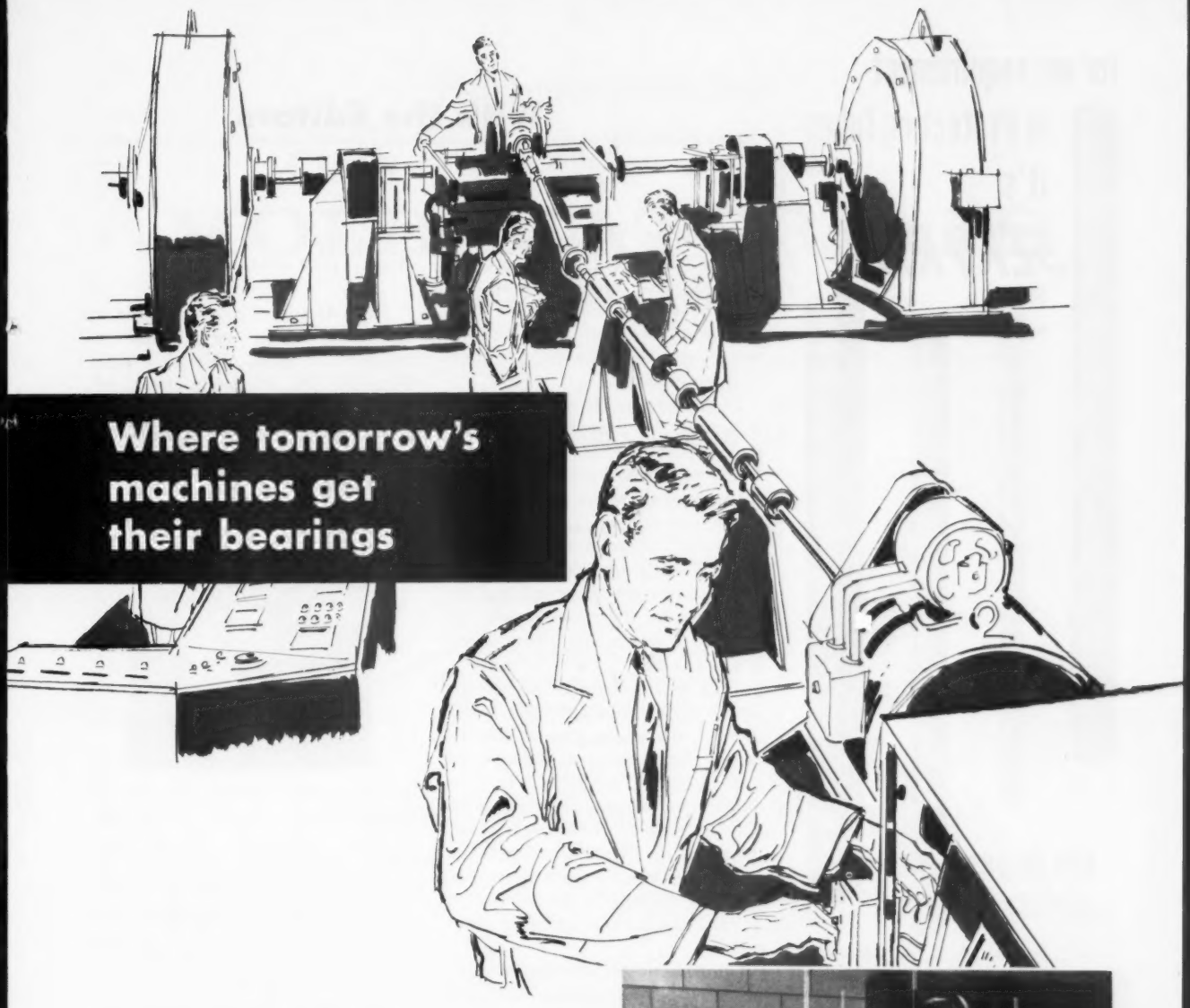

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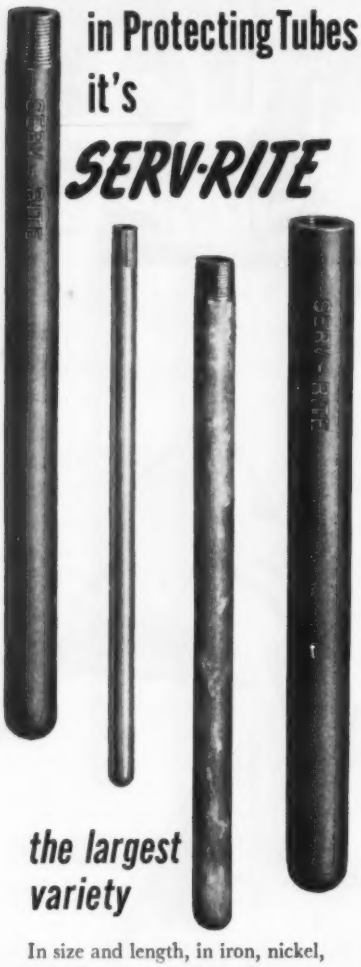

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Circle 561 on Page 53

With the Editors

● **A SMEAR:** Foundrymen watching the Chevrolet-Dinah Shore TV show Sunday evening, April 19, must have been shocked and thoroughly disgusted at the deliberate smear attack made on the iron foundry industry.

Dinah led into the commercial by indicating in honeyed tones that some benighted souls still were using "alloy cast iron crankshafts." The commercial showed a rack with two shafts, one labeled "cast iron" and the other "forged steel." The test of these shafts was phony, so far as service tests were concerned, and the comments on the relative merits of the two shafts were unfair, if not downright lies.

Why would General Motors, the largest industrial organization in the country, make this uncalled for attack on an industry as basic as the iron foundry industry, which is made up of several thousand companies? Most of these come under the category of small business.

General Motors uses large tonnages of castings in the production of cars, trucks, and its other products.

General Motors operates a number of captive foundries supplying high-grade castings for its use.

General Motors operates a number of commercial foundries selling their products to a wide field. One of its foundries had a display at the Engineered Castings Show in Chicago where it showed many high-quality, intricate castings.

General Motors uses cast crankshifts in its Pontiac car. True, these are pearlitic malleable iron. But the crankshafts in competing cars, which were the target for Sunday night's attack, are not "ordinary cast iron," which was held up in scorn, but ductile cast iron. (The Pontiac story is on p. 150.)

We wonder what the thousands of workers in foundries throughout the country who happened to hear Sunday night's program thought of these unfair tactics?

And we wonder what the workers in the many General Motors foundries thought of their company?

I thought the commercial in mighty poor taste.

—o—

High Award: Congratulations to R. W. deWeese, vice president in charge of sales, Electric Steel Foundry Co., Portland, Oreg., for

receiving the "Silver Knight of Management" award from the Greater Portland Management Club. This is the highest honor that is bestowed by the club upon an individual, and was made at the Tenth Northwest Management Conference banquet on March 7.

—o—

100 Years: Gardner-Denver Co., Quincy, Ill., is celebrating its centennial this year. The company has prepared a 17-minute sound and color film, "What's in a Name," portraying the development of the firm since its founding in 1859. Governors for steam engines were the first product. Today the company makes equipment for construction, petroleum, mining, and general industry. The film may be obtained for showing without charge.

—o—

Foundrymen Win: Last year our sister publication *Steel* conducted a Cost Crisis Awards Competition designed to find ways to lower unit product costs through more efficient use of materials. Two winners were selected from each of five groups, based on number of employees.

Foundries must offer an excellent field for such cost savings, since

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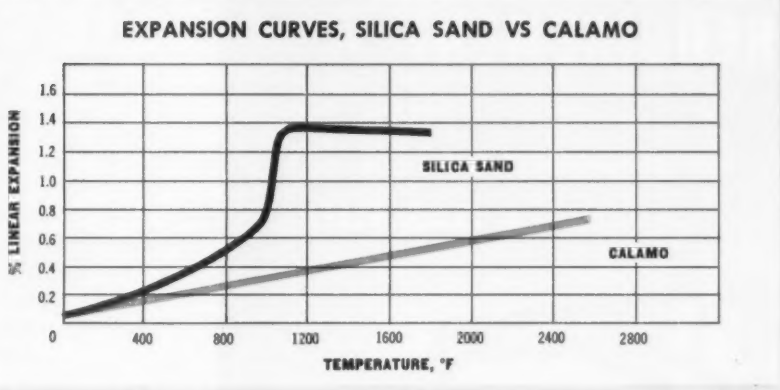
REFRACTORY MOLD MATERIALS

for metal casting



Calamo for Investment Molds

CALAMO, one of the extensively used Harbison-Walker products for molding is an alumina-silica refractory of optimum sizings for various molding mixtures. Its fusion point is 100° F. higher than that of normal silica sand mixes.

The chart above shows the exceedingly desirable expansion curve of CALAMO as compared with that of silica sand.

CALAMO, used as the major constituent of precision casting investment mixes, improves dimensional constancy of molds, makes them stronger and more resistant to erosion by metal flow.

Investment costs are measurably reduced because an appreciably lesser amount of bonding agent is needed. This is attributable to the very desirable particle sizing and the equiaxed, dense grains of CALAMO.

CALAMO, used alone or as the major part of conventional dry sand molding mixes in rammed or in slinger-placed sand molds, provides not only the very desirable low thermal expansion characteristics particularly suited for precision casting but also provides the required refractoriness for metals and alloys melted at unusually high temperatures.

H-W Flintgrain for Ceramic Shell Molds

H-W FLINTGRAIN is an alumina-silica refractory, similar in composition to CALAMO, having the same very desirable low thermal expansion characteristics, but greater angularity of grain shape.

The angular grain shape and optimum size distribution make H-W FLINTGRAIN ideal for securing maximum compactness in the mold. It is used with special benefit for making ceramic shell molds and for similar applications in which dense, compact mold sections of greatest volume stability at all temperatures, are of paramount importance.

Illustration of angulate shape of H-W Flintgrain enlarged x3

Write us for info mation regarding these and other Harbison-Walker products — mold wash materials — ceramic molding media — mold sand bonding clays.

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World's Most Complete Refractories Service

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HAUSFELD

A FURNACE FOR EVERY NON-FERROUS MELTING REQUIREMENT

INTERCHANGEABLE FOR

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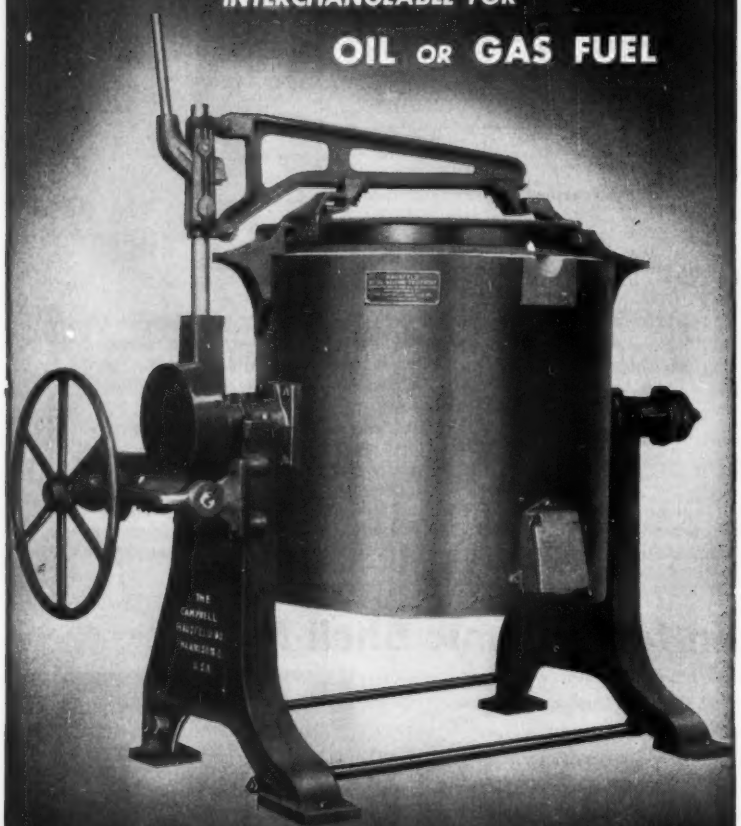

Built for Service

The Campbell-Hausfeld Co.

300-320 MOORE ST. HARRISON, OHIO

three of the ten winners were from foundries.

W. Arthur Coakes, plant engineer, General Foundry & Mfg. Co., Flint, Mich., told how engineers applied a bit of automation to cupola charging facilities, saving 41 cents on every ton of iron melted, and improving quality.

C. T. Costas, foundry manager, Studebaker-Packard Corp., South Bend, Ind., told how new equipment and improved handling for production of jacket and barrel cores reduced costs from $171.78 to $49.08 a day.

Jack B. Sieforth, work simplification co-ordinator, Electric Steel Foundry Co., Portland, Oreg., reported on an attack on casting inspection costs that provided an estimated productivity gain of $103,815 a year.

Congratulations to these foundrymen for taking a sizable share of the awards.

Steel is repeating the Cost Crisis Awards Competition in 1959.

—o—

Men: There have been many rewards during the more than 35 years I have been associated with

the foundry industry, but the greatest source of satisfaction has been the many wonderful friends in every department of foundry activity.

At the annual meeting of the Steel Founders' Society of America in Chicago in March, I had the great pleasure of visiting again with a long-time friend, William H. Worrilow. He is one of the founders (in 1911) and the first and only president of Lebanon Steel Foundry, Lebanon, Pa., also a past president of SFSA, and a real gentleman. He had celebrated his 82nd birthday the day before the accompanying photo was taken, but you would never guess it. Bill is on the left.

Thanks, Bill, for a pleasant and profitable gabfest. F.G.S.

Soffel's MOLDABLE THERMOTOMIC COMPOUND

the best moldable compound — by far!

Wherever you see Soffel's Red Devil *there's real work* being done!

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share of this **FOUNDRY** market...

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KRAUSS

Self-Cleaning
Taper Slot
CORE VENTS

Will Not Clog . . .
Leaves No Mark!

Krauss Core Vents are knurled on sides to assure greater gripping power.
Underface — reinforcing rings prevent slots from closing when core vents are hammered into place.

Because the slots are *always open,* cores are harder packed, with no air cushions to cause soft spots. Krauss Taper Slot Core Vents eliminate clogging . . . which means less frequent cleaning. This results in less down time — greater production time. Mail coupon for prices.

WRITE OR CALL TODAY FOR COMPLETE DETAILS

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Please rush information and prices on:

☐ Krauss Self-Cleaning Taper Slot Core Vents ☐ Steinex Slower-Hardening Binders

NAME _____ TITLE _____

FOUNDRY _____

CITY _____ STATE _____

CALENDAR of Meetings

May 13-15—National Industrial Sand Association, annual meeting, Homestead, Hot Springs, Va.

May 14-16—American Institute of Industrial Engineers, annual national conference and convention, Biltmore Hotel, Atlanta.

May 20-22—Society for Experimental Stress Analysis, national spring meeting and exhibition, Sheraton Park Hotel, Washington.

May 25-26—Malleable Founders' Society, annual meeting, Homestead, Hot Springs, Va.

May 25-27—American Society for Quality Control, annual convention, Public Hall, Cleveland.

May 25-28—Design Engineering Show, sponsored by machine design division, American Society of Mechanical Engineers, Convention Hall, Philadelphia.

June 9-12—Institute of British Foundrymen, annual conference, Scarborough, England.

June 9-12—Material Handling Institute, 1959 Exposition, Public Hall, Cleveland.

June 18-20—American Foundrymen's Society, 4th Foundry Instructors Seminar, University of Illinois, Urbana, Ill.

June 21-26—American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

June 22-26—Air Pollution Control Association, annual meeting, Statler Hilton Hotel, Los Angeles.

June 23—Hoist Manufacturers Association, Statler Hilton Hotel, Buffalo.

June 25-27—Penn State Foundry Conference, Pennsylvania State University, University Park, Pa.

Sept. 21-22—Steel Founders' Society of America, fall meeting, Homestead, Hot Springs, Va.

Sept. 21-25—Instrument Society of America, annual Instrument-Automation Conference and Exhibit, International Amphitheatre, Chicago.

Sept. 24-25—Missouri Valley Regional Foundry Conference, Missouri School of Mines & Metallurgy, Rolla, Mo.

Oct. 1-2—Central New York Regional Foundry Conference, Drumlins Country Club, Syracuse, N. Y.

Oct. 4-10 — International Foundry Congress, organized by Spanish Institute of Iron & Steel, Madrid, Spain.

Oct. 7-9—Gray Iron Founders' Society, annual meeting, Fairmont Hotel, San Francisco.

Oct. 8-9—Michigan Regional Foundry Conference, Pantlind Hotel, Grand Rapids, Mich.

Oct. 10-13 — Conveyor Equipment Manufacturers Association, annual meeting, Grand Hotel, Point Clear, Ala.

Oct. 11-16—American Society for Testing Materials, Pacific area national meeting, Sheraton-Palace Hotel, San Francisco.

Oct. 15-17—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 16-17—New England Regional Foundry Conference, Massachusetts Institute of Technology, Cambridge, Mass.

Oct. 22-23—Ohio Regional Foundry Conference, Deshler-Hilton Hotel, Columbus, Ohio.

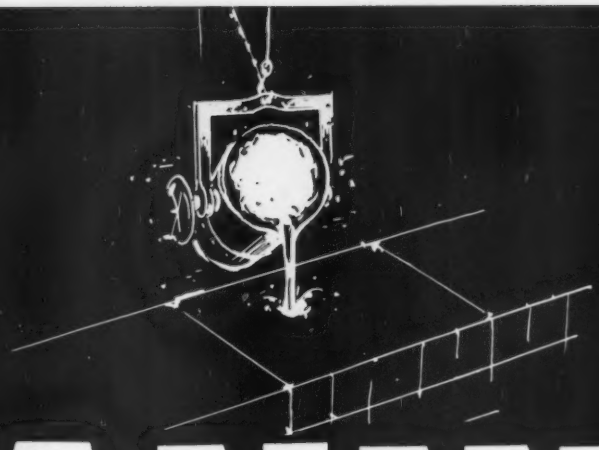
Oct. 23-24—Non-Ferrous Founders' Society, annual meeting, Bedford Springs Hotel, Bedford Springs, Pa.

Nov. 5-6—National Foundry Association, 61st annual meeting, Roosevelt Hotel, New York.

Nov. 9-11—Steel Founders Society of America, Technical & Operating Conference, Carter Hotel, Cleveland.

Nov. 16-20—International Automation Congress & Exposition, New York Trade Show Building, New York.

Dec. 2—Electric Overhead Crane Institute, annual meeting, Carlton House, Pittsburgh.



FANNER

the name that signifies the

finest in CHAPLETS and CHILLS

for every casting purpose

since 1894

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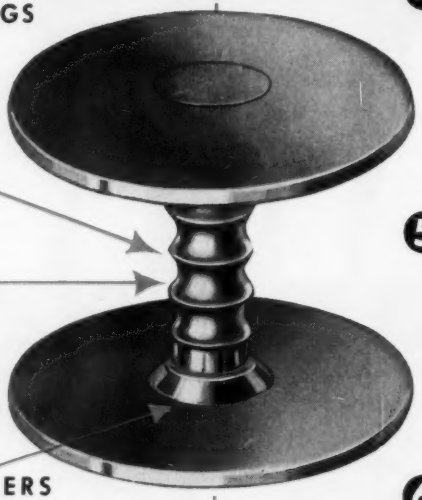
fine FANNER

...the Best chaplets ever developed

THREE EXCLUSIVE FEATURES and these standard features



1 FEATHEREDGE FUSION RINGS

Knife-like edges on the multiple rings heat instantaneously to fusion temperature — completely sealing chaplet into casting and eliminating leakers.

2 COMPLETE CONTACT RADIUS GROOVES

Molten metal rolls up solidly against the rounded bases of the radius grooves. Greater chaplet area contact results in maximum fusion. No sharp angles to trap gasses or weaken stem strength.

3 COUNTERSUNK SHOULDERS

Heavy, tapered shoulders provide solid support to plates — allow full contact with molten metal. No sharp angles to create voids usually formed under heads of ordinary chaplets.

4 FULL STRENGTH

Reinforced construction at all required points provides maximum support without use of extra heavy metal.

5 PURE TIN COATING

The surest protection against rust, as well as aid to fusion. Readily alloys with iron and steel, lowering melting point and improving fusion. Also available in pure copper.

6 PRECISION TOLERANCES

Held to ±.002 on most sizes, Fanner reputation for accuracy is unequalled.

HERE IS WHY THESE FEATURES MEAN BETTER CASTINGS FOR YOU

✓Assured Core Support ✓Maximum Fusion
✓Freedom from Leakers ✓Accurate Wall Thickness

The Groovestem Chaplet is the direct result of Fanner pioneering and development to provide foundries everywhere with chaplets that would assure better quality castings. Since their introduction, millions of Fanner Groovestem Chaplets have been used by all types of foundries and it has been proved that these chaplets are responsible for savings in time and labor and for reducing casting scrap. For the best results always specify Fanner Groovestem Chaplets, they are available in a wide variety of styles and sizes.

Write for catalog or samples and prices.

THE FANNER MANUFACTURING CO.

Designers and manufacturers of fine FANNER CHAPLETS AND CHILLS

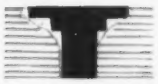
GROOVESTEM CHAPLETS

to insure maximum fusion and support

FANNER DESIGN TAKES ADVANTAGE OF ALL METAL CHARACTERISTICS

COUNTERSUNK SHOULDERS ELIMINATE GAS POCKETS

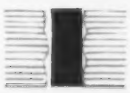
Sharp, right angle shoulders of conventional types of chaplets form large gas pockets.



Raised shoulder of this type reinforces but tends to form small gas pockets.

Fanner Countersunk shoulder has a taper design which reinforces head and eliminates gas pockets.

FEATHEREDGE FUSION RINGS ELIMINATE LEAKERS



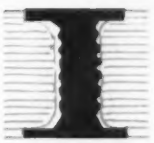
Rolling metal does not seal against straight side of conventional stem; small pockets remain.

Deformed stem offers better sealing surface for metal, but some voids may be created on inside radii.

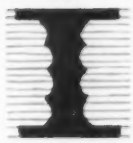
Knife-like edges of fusion rings of Fanner Chaplet heat instantly, fuse completely, eliminate leakers.

RADIUS GROOVES EFFECT MAXIMUM FUSION

Conventional chaplet fails to fuse completely both along stem and at shoulders.



Threaded stem creates gas pockets at base of threads.



Rounded grooves of Fanner Chaplet permit metal to "lay up" close to stem and effect maximum contact and fusion.

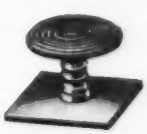
SPECIFY FANNER GROOVESTEM CHAPLETS

Studies conducted by Battelle Memorial Institute of Columbus, Ohio, supplemented by field tests in leading foundries, prove that the new Fanner Groovestem Chaplet provides the maximum in core support and completeness of fusion. Companies doing critical casting work have confirmed its superiority and have standardized on this new chaplet. To insure that you get maximum casting efficiency on every job, always ask for Fanner Groovestem Chaplets. They are stocked in substantial quantities to give you the fastest possible service.

FANNER GROOVESTEM CHAPLETS ARE AVAILABLE IN THESE TYPES

MOTOR

DOUBLE HEAD



BUTTON HEAD

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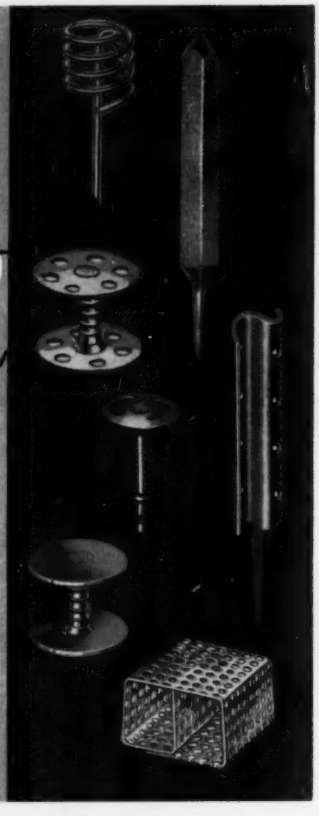
FANNER puts its FACTORY

at your fingertips . . .



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Designers and Manufacturers of Fine Fanner Chaplets and Chills

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YOU'LL DO A BETTER JOB

with H. V. ADAMS DESIGNED

HIGH EFFICIENCY FOUNDRY TOOLS

"UNIVERSAL FREE WHEELING"

FOUNDRY SAND RIDDLE

with the Double Eight Vibration

Because of its convenient size, light weight and good riddling capacity it long has been a favorite in the foundry. It also can be used for mixing core sand or for sifting sand directly into molds.

The mechanism is entirely enclosed protecting it from harmful dust and grit.

The main frame is cast in very strong tough aluminum.

It uses quick change ferruled sieves with 20 in. diameter sifting area. There are no loose wires to harm hands.

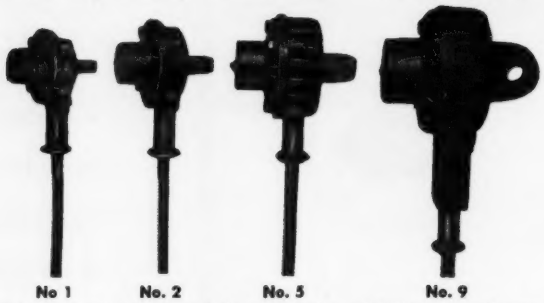
THE "ROTOPLANE" SPEED SIFTER

WILL GIVE YOU

- SPEED
- ECONOMY
- SAFETY
- LONGER LIFE
- GREATER SIFTING CAPACITY

Its sturdy one-piece frame and long shaft add to vibration effectiveness. The sealed-in mechanism assures protection of motor and bearings from exposure to dust and grit. This sealed in protection and "Rotoplane's" free-rotary action vastly increase bearing life. No exposed moving parts endanger the operator. Sieves have 20 inches diameter clear sifting area—are mounted in a smooth steel ferrule with no jagged edges to cause dangerous cuts and scratches.

"RED (Devil) ELECTRIC" VIBRATORS



No 1 No. 2 No. 5 No. 9

These hard hitting Adams designed Vibrators have served the foundries for over 30 years. They are provided with a 6 foot 3 wire authorized cable and 3 wire grounded connector which, when connected with our 3 wire grounded Red Electric Knee Switch, automatically grounds the vibrator protecting the worker from shock. The vibrators have passed the U. S. Government code inspection.

Other Foundry Products:

- No. 11 NOISELESS TYPE VIBRATOR
- A-20 ELECTRIC VIBRATOR
- RED ELECTRIC KNEE SWITCHES
- "ROTO" ADJUSTABLE BIN VIBRATOR
- 2 MIN. UNIVERSAL FINENESS TEST SIFTER.
- UNIVERSAL TRIPOD CARRIER

ORDER ALL SIFTERS AND VIBRATORS WITH GROUND WIRE!!

FOUNDRY SUPPLIES MANUFACTURING CO., NOT INC.

2221 Orchard Street - Chicago 14, Illinois

Established 1918 — Cable Address: "Rotoplane Chicago" — H. V. ADAMS, Mgr.

THE PERPLEXING PROBLEM OF HARD SPOTS

Another costly mystery solved–by the man from Kaiser Aluminum

THE PUZZLING FACTS. An aluminum foundryman recently made a disturbing discovery: his castings contained many inclusions and hard spots. These made the castings very unsatisfactory. In addition, they were difficult to machine—and caused excessive wearing of tool bits.

HOW THE CASE WAS SOLVED. It was a frustrating problem. But the man from Kaiser Aluminum found the fault: ineffective fluxing and degassing techniques were being employed. When these were corrected, the hard spots disappeared and production returned to normal.

WE LOVE A MYSTERY. This is one of many actual cases solved by Kaiser Aluminum working with a customer. Perhaps *you* have a mystery one of our technical engineers might help solve? He's ready to give you expert advice on any casting problem—including mold and die design, alloy selection, heat treatment, finishing, fluxing, metal transfer.

FULL ALLOY AVAILABILITIES. Kaiser Aluminum can supply you *fast* with a wide selection of casting alloys to suit any engineering requirement—from general purpose, low stressed alloys to high purity alloys having good properties at elevated temperatures.

FOR PIG AND INGOT with a free sleuthing bonus, call your nearest Kaiser Aluminum sales office now. Or write: Kaiser Aluminum & Chemical Sales, Inc., 919 N. Michigan Ave., Chicago 11, Illinois.

KAISER ALUMINUM

THE BRIGHT STAR OF METALS

See "MAVERICK" • Sunday Evenings, ABC-TV Network • Consult your local TV listing

Circle 570 on Page 53

BROADEN

YOUR CASTINGS MARKETS

with the Magnaflux 4-Point Program that helps you sell more castings at lower cost–"tested" for the best on-the-job performance

Ferrous and nonferrous including the increasingly popular aluminum, too.

Here's What the Magnaflux 4-Point Program is:

1. Improve design for casting

With Stresscoat brittle coatings, make it easy for your customer to design *good* castings. You get "conversions," and hold present accounts with lighter castings that are easier to pour for more foundry profit at lower customer cost!

2. Establish useful standards

Make useful quality levels easier for you, by helping your customer specify critical tests only in areas needed! After Stresscoat work you know the few areas on the part that carry high stress, and the many areas where minor defects make no difference.

Base testing standards only on the need, to assure useful and reliable castings, — but not perfection. This applies to both ferrous and non-ferrous castings.

3. Gain better foundry control

With Magnaflux Test Systems you have a continuous check available from pilot casting to final production. You spot trouble fast and correct its cause. Finding pouring problems or the source of handling cracks saves the time and money wasted in processing castings destined for reject. You get more production, with less trouble!

4. Promote the reputation and acceptance of <u>your</u> castings

"Tested by Magnaflux" certifies that your castings are fully reliable for the service intended. This recognition helps create new uses for your castings, and more foundry customers.

The more you prove out the best on-the-job casting performance the more sales and higher profits you'll gain. Ask our Magnaflux Field Engineer to give you all the facts on our 4-point Program and how it helps you tap new markets. Write or call for a meeting. No obligation, of course.

These Magnaflux "Test" Tools will help you get them

MAGNAFLUX-MAGNAGLO
for magnetic metals. Prices from $195.

ZYGLO
for nonferrous metals, stainless. Complete kits from $125.

STRESSCOAT
Shows where and how stresses occur, during design or pilot stage.

Y-5 YOKE KIT
Portable, lightweight magnetic particle testing. Complete kit only $195.

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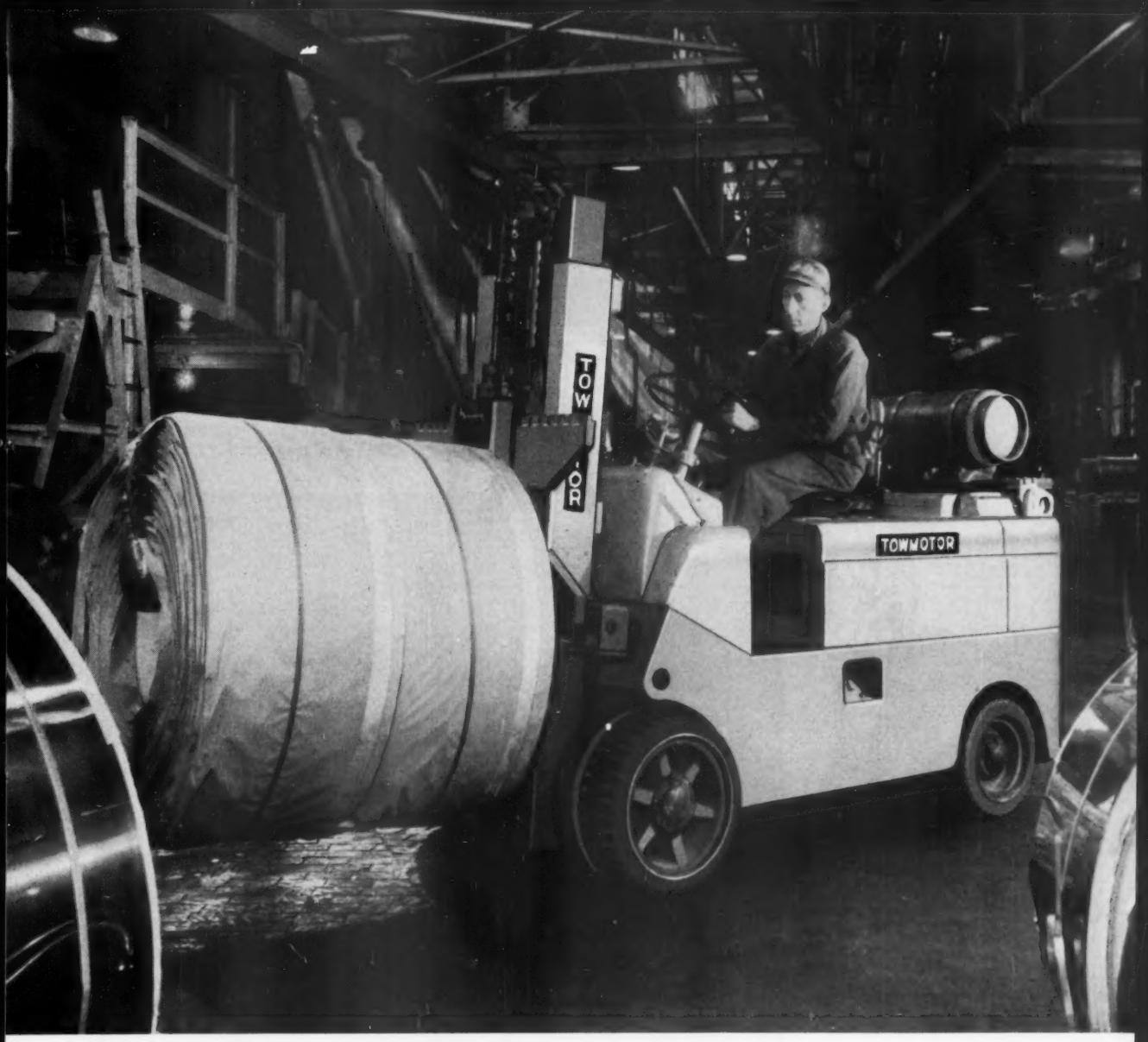
The Hallmark of Quality in nondestructive test systems

Circle 571 on Page 53



Greatest get-up-and-go...

Of all fork lift trucks, *this Towmotor Pace-Maker has it!* Mass-handling miracles seem to happen every minute it's on the job. Its hydraulic muscles hustle heavy loads through storage, production and shipping with a real promise of extra profits *around the calendar.*

Let us send you latest on-the-job facts applying to your specific type of factory, mill or warehouse operation. Ask for Certified Job Studies relating to your own business — and the new *Pace-Maker* Booklet SP-23. Write *Towmotor Corporation, Cleveland 10, Ohio.*

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THE MATERIAL HANDLING INSTITUTE'S EXPOSITION
CLEVELAND AUDITORIUM
JUNE 9-12 1959
BOOTHS 1302-1307-1404

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THE ONE-MAN-GANG
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GERLINGER

Gerlinger Carrier Co. is a subsidiary of Towmotor Corporation

Circle 572 on Page 53

Harry Demerjian increased

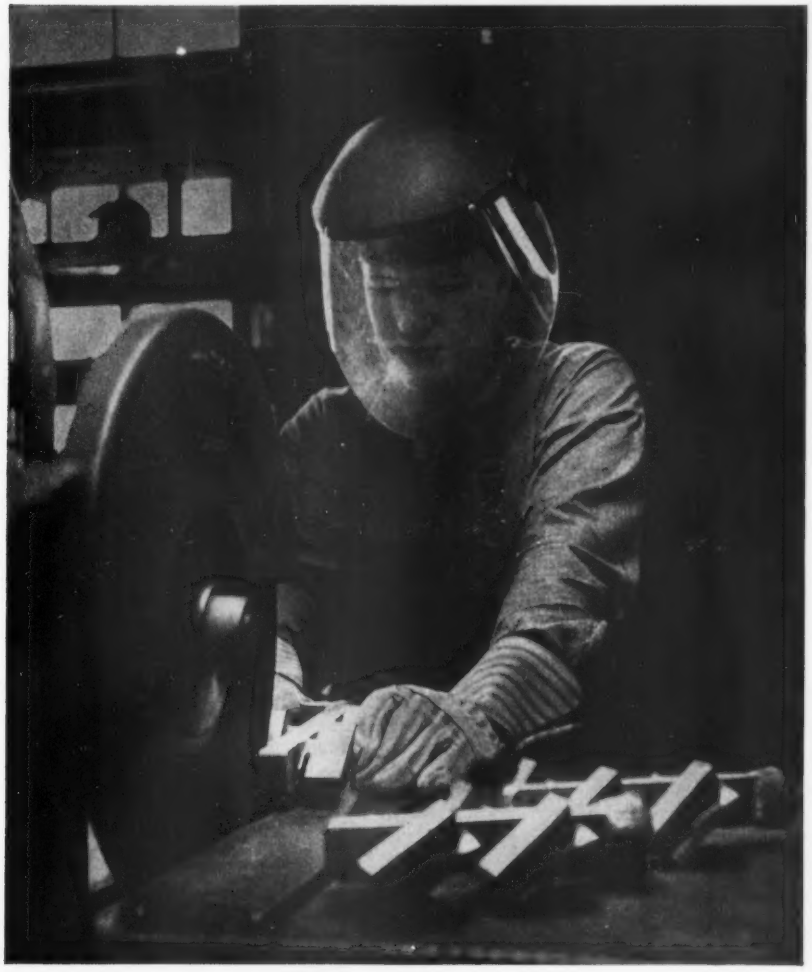
Harry Demerjian has more than 25 years experience as an abrasive specialist. After a war-time career in the U. S. Army Signal Corps, he set up his own business, Abrasive Sales Co., in New York City and he's been a highly successful Bay State representative ever since.

cut-off production 50% at Frank Roth Co.

They had a right to be skeptical at the Frank Roth Foundry in New York City, when they first saw Bay State's BZ2AA cut-off wheel. A wheel that's only 1/8" thick looks pretty thin when you've been using a conventional 16" x 5/32" x 1" cut-off. When you start thinking about possible warpage and flutter, not to mention *shattering*, it's enough to give you nightmares.

BUT . . . Bay State distributor Harry Demerjian put on a demonstration that convinced operators, foremen and management, too, that the BZ2AA was one of the safest cut-off wheels ever made. On top of this, it cut straight and true without a sign of flutter . . . and it cut faster, lasted longer and saved material because its thin edge ground away 20% less metal. Cutting investment castings of extremely hard and expensive materials, the BZ2AA increased production a full 50% and made substantial savings by increasing scrap salvage, too.

Like Harry Demerjian, your own Bay State representative is an experienced abrasive specialist as well as a good salesman. *Better grinding at lower cost . . . that is his business.*

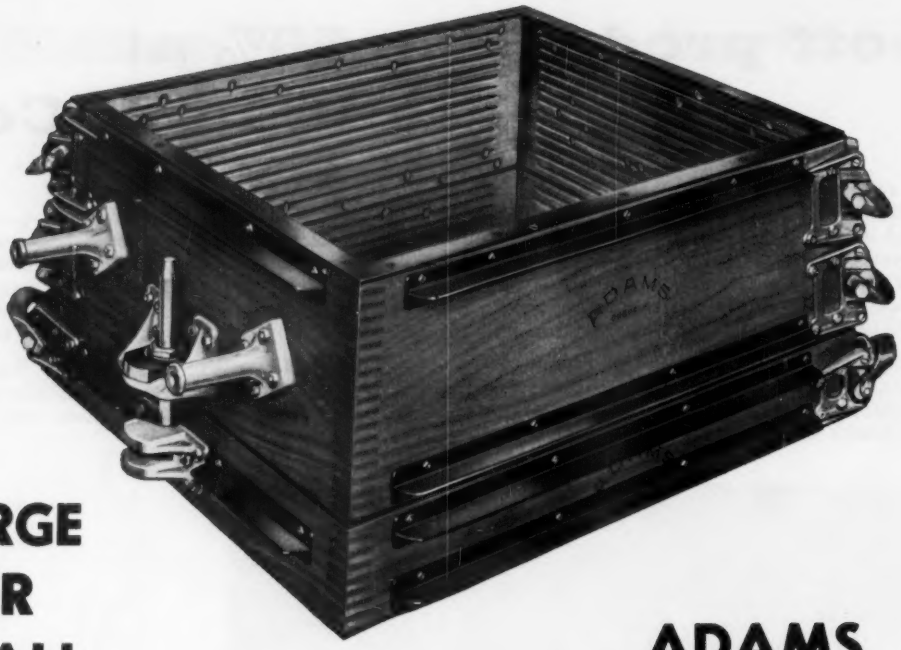


Foundry Foreman Henry Koster cuts gates off extremely hard cobalt-chromium-tungsten swaging die castings . . . a job that goes 50% faster with Bay State's BZ2AA than it did with the previous wheel.

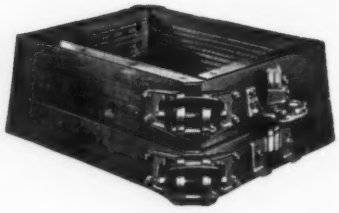
BAY STATE ABRASIVES

BAY STATE WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh, Los Angeles. *Distributors:* All principal cities.



LARGE OR SMALL



Patent No. 2393200
Other Patents Pending

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PIN AND EAR ARRANGEMENT SUPPLIED TO SUIT YOUR PRESENT PATTERN PLATE GUIDES

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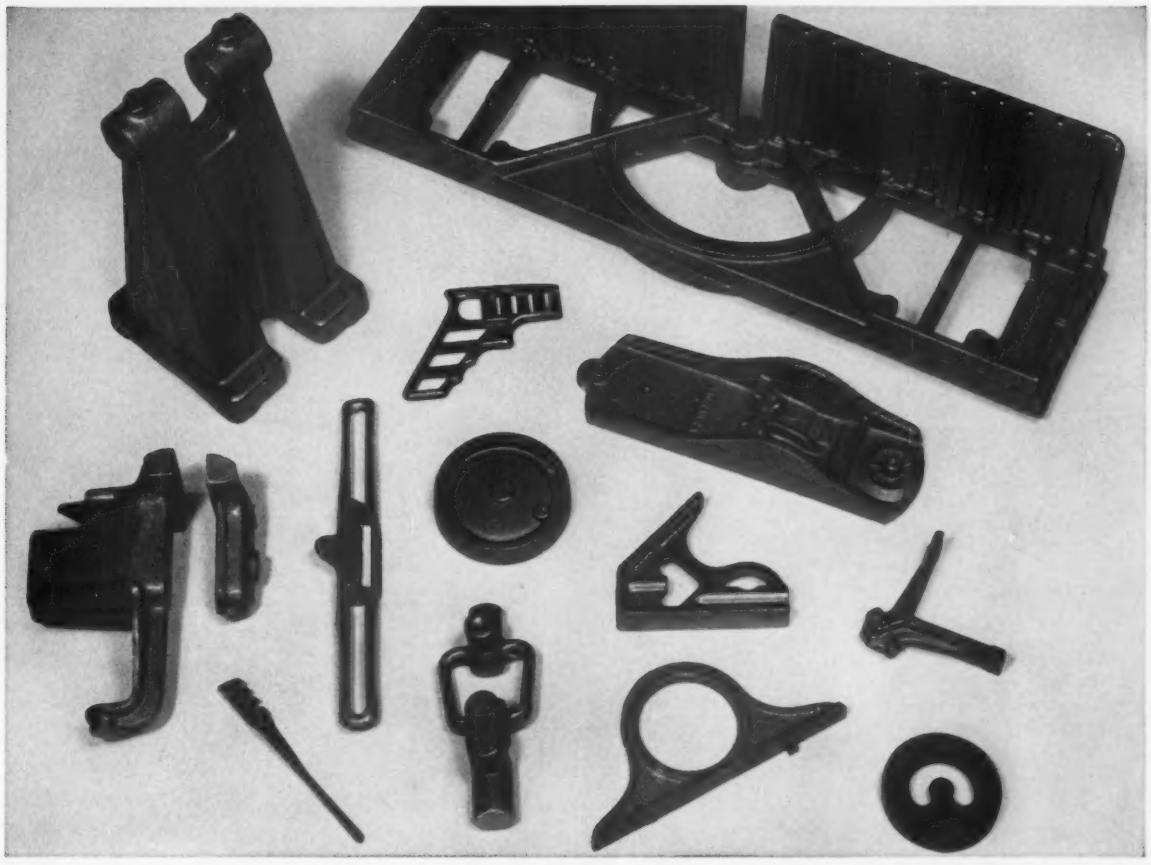
Circle 574 on Page 53



Cast with Hanna iron, precision tool parts for jack planes, bench vises, saw handles and miter boxes require a minimum of machining because these gray iron castings are perfect and clean.

Why Millers Falls uses HANNA PIG IRON for hundreds of different precision-built tools

For more than 90 years Millers Falls Company has been manufacturing precision carpenter and machinists tools for home and industry. Some 1,500 different high quality tools are produced at the Greenfield, Massachusetts plant alone. More than 50% of the parts are made from gray iron castings containing Hanna malleable pig iron.

Many of these tools and tool parts require only shot cleaning before being assembled because of the close tolerance casting employed.

Quality, uniformity, strength and denseness, which are integral characteristics of Hanna pig iron, are reflected in the firm's record of perfect castings time after time.

Whatever you cast, large or small, there's a Hanna pig iron to do the job best. All regular grades, plus HANNATITE® and Hanna Silvery, are available in the regular 38-lb. pig or HANNATEN® 12½-lb. ingot. For the iron to suit your particular needs, call a trained Hanna representative for assistance.

Breaker slots on glass cutter castings require no machining. Illustration shows glass cutters immediately after shakeout.

THE HANNA FURNACE CORPORATION
Buffalo • Detroit • New York • Philadelphia
Merchant Pig Iron Division of
NATIONAL STEEL CORPORATION

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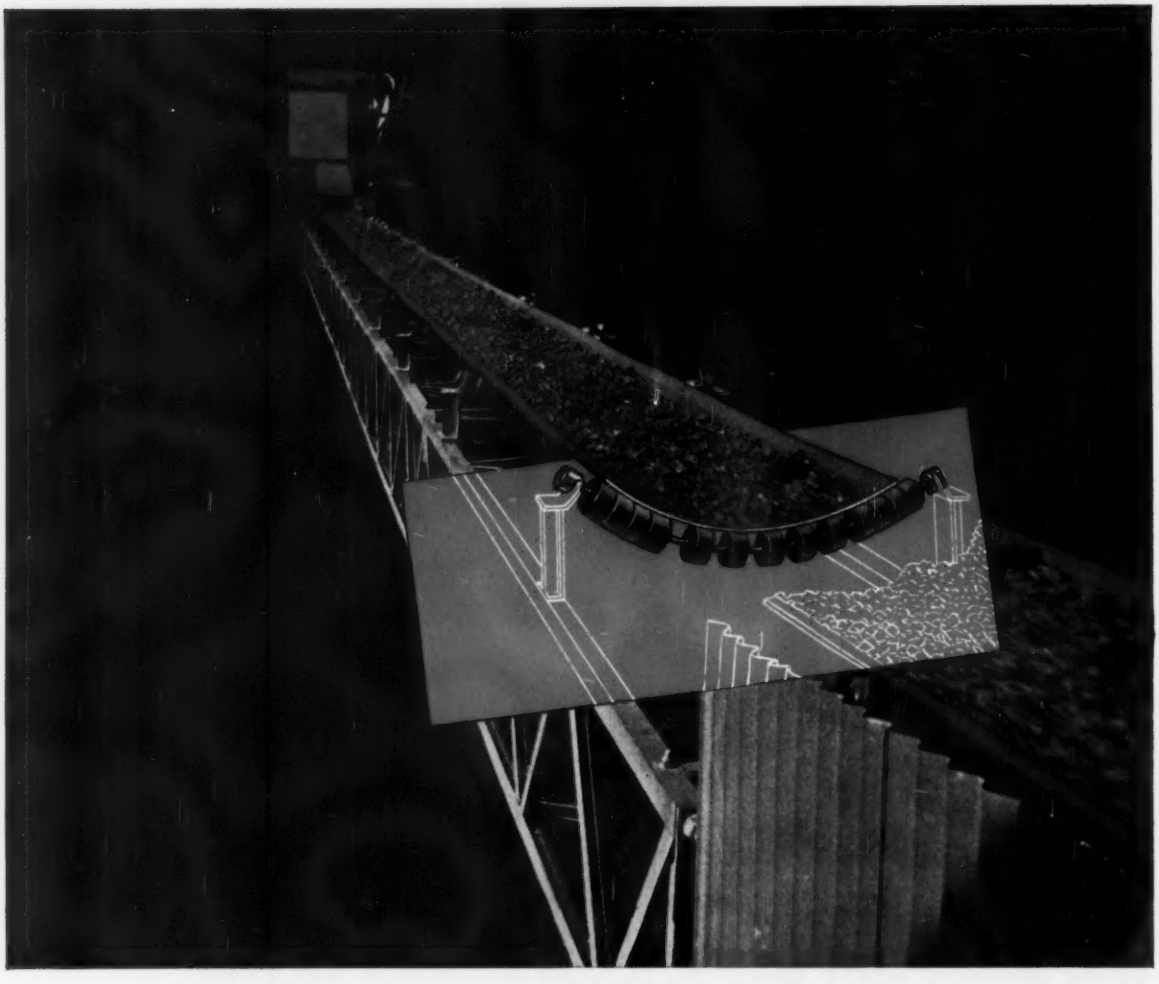

JOY LIMBEROLLER . . THE *easy going* BELT CONVEYOR IDLER WITH PLENTY OF BACKBONE

Radically different from all other idlers, the Joy Limberoller is a flexible steel cable suspended between two sealed bearings . . . neoprene discs are molded to the cable . . . forming a single roll idler which turns on its own axis. This imparts a flexing action which is self-cleaning . . . prevents material build-up, a source of trouble with conventional idlers.

The Joy Limberoller idler supports the belt across its entire width in a true catenary . . . doesn't bend or pinch the belt between steel rolls like conventional idlers. Hard materials don't "bump along" from idler to idler, either. Belt life is increased 20% and more.

Abrasive or corrosive materials are no problem, because only two bearings are used. They are up out of the dirt zone, not hiding down under the belt where inspection and maintenance are difficult. Joy Manufacturing Company has never replaced a single bearing due to normal failure. Heard enough? Get the whole story from:

Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa. In Canada: Joy Manufacturing Company (Canada) Limited: Galt, Ontario.

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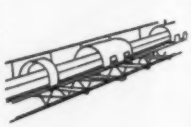
INDUSTRIAL COMPRESSORS



CONVEYORS

ELECTRICAL CONNECTORS

FANS AND BLOWERS

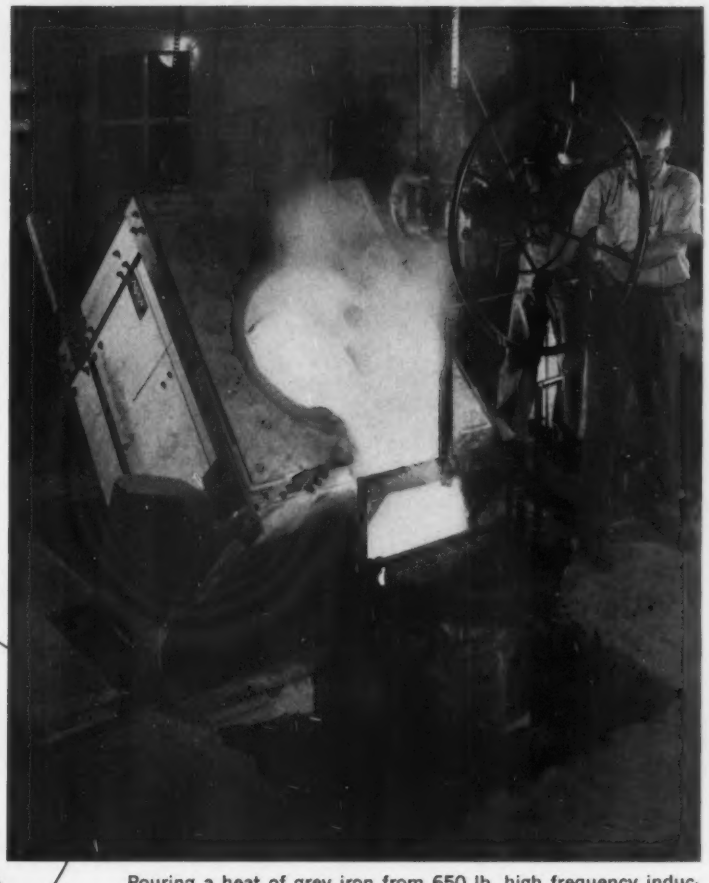
JOY

SINCE 1851 . . . OVER 100 YEARS OF ENGINEERING LEADERSHIP

Circle 576 on Page 53

WITH TAYLOR ZIRCON RAMMING MIX

Mould Manufacturer cuts induction furnace lining costs by 50%



Pouring a heat of grey iron from 650 lb. high frequency induction furnace lined with TAYLOR ZIRCON No. 717 Ramming Mix.

TAYLOR ZIRCON No. 717 Ramming Mix has cut refractory lining costs *in half* for a mid-west mould manufacturer. In addition, average number of heats has increased. This company melts grey iron in 650 lb. and 1000 lb. induction furnaces to produce moulds for the glass industry.

Alert foundries are standardizing on TAYLOR ZIRCON Ramming Mix as the most economical lining for high frequency furnaces. High softening point, low thermal conductivity, high di-electric strength, and volume stability make TAYLOR ZIRCON an excellent refractory for this service. For detailed information, write direct, or call in a Taylor field engineer.

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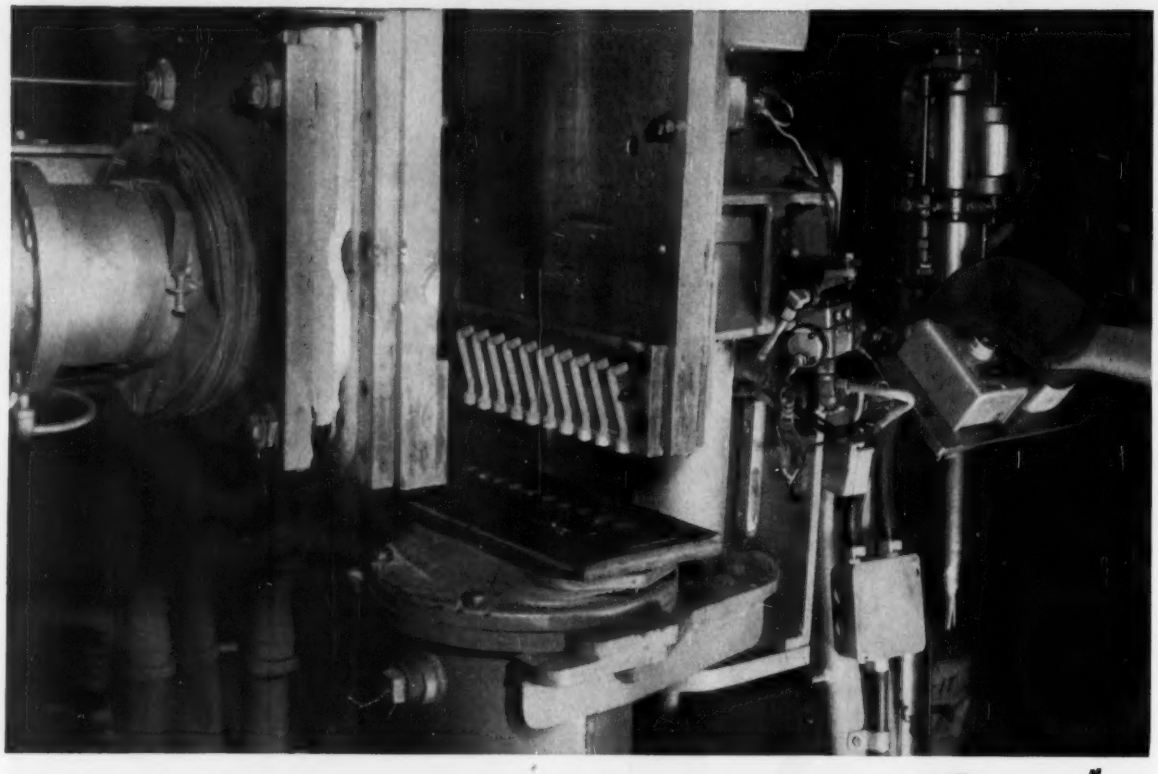
Circle 577 on Page 53

FAST, INEXPENSIVE AUTOMATION OF SHELL CORE BLOWER



with Bellows "Controlled Air Power"

Management of progressive Canton Malleable Iron Co., Canton, Ohio turned to Bellows "Controlled-Air-Power" to automate a Shalco Model MC-5 Shell Core Blower. Now, a woman operator can consistently produce 4500 top quality cores per day without fatigue.

At the push of a button, interlocked and synchronized Bellows "Controlled-Air-Power" Devices advance the core body and sand hopper cylinders, roll the unit over 180°, release the sand-resin mix, expedite and time its flow, return the entire assembly to its original position, and retract the core body and sand hopper cylinders . . . all automatically! The operator merely loads, presses a button and unloads.

This is only one example of practical, low-cost "spot-a-mation" of various foundry operations with Bellows equipment. It is described in detail, with equipment list and wiring diagram, in Bellows "Spot-A-Mation" Idea File 11.0-8. For your free copy, address Dept. FO-559, The Bellows Co., Akron 9, Ohio. In Canada, Bellows Pneumatic Devices of Canada, Ltd., Toronto 18.

1344-B

The Bellows Co.

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

AKRON 9, OHIO

OTHER INDUSTRIAL DIVISIONS OF IBEC: Sinclair-Collins Valve Co., Valvair, Akron, Ohio • V. D. Anderson Co., Cleveland, Ohio

Circle 578 on Page 53

Late News

EQUIPMENT ACTIVE: February bookings of new foundry equipment were the best in almost nine years, the Foundry Equipment Manufacturers Association reports. Its sales index was 237.1, against 127.4 in January and 57.6 a year ago.

March orders for industrial furnaces topped $6 million, up 125 per cent from the February volume, according to the Industrial Heating Equipment Association. First quarter sales were 29 per cent ahead of last year.

Order index of the Material Handling Institute for February was 124.8, against 115.8 in January, and 93.5 in the 1958 month.

CONSOLIDATION: General Motors Corp. is consolidating its Central Foundry and Fabricast Divisions. The latter's plants at Bedford, Ind., and Jones Mills, Ark., will be designated as the Fabricast Plants of Central Foundry Div. James H. Smith, Central Foundry general manager, will supervise the combined activity. George A. Zink, Fabricast general manager, will continue as manager of the two Fabricast plants.

FOUNDRY EXPANSION: New Iron Foundry Co., Romulus, Mich., is completing a plant expansion which will double its gray iron casting capacity. Peasley Products Inc., Die Casting Div., Stratford, Conn., is undertaking a large expansion of its zinc and aluminum diecasting and permanent mold casting facilities. Paxton-Mitchell Co., Omaha, Nebr., has more than doubled its gray iron casting capacity to 125 tons daily in an expansion program which in-

Foundry Statistics

Iron and Steel Scrap Consumption

(Gross tons*)

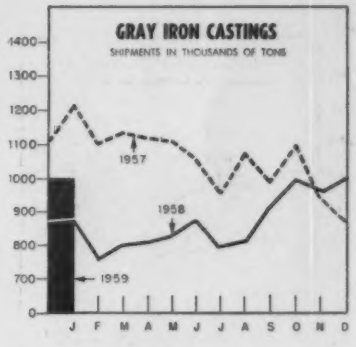
	All Scrap Total	By Types of Furnace — Cupola Total	Air Total	Electric Total
1957				
Dec.	4,281,414	661,918	76,091	542,005
Total	65,688,592	9,220,405	1,026,951	8,876,400
1958				
Jan.	4,072,071	704,454	76,959	566,225
Feb.	3,491,441	611,394	64,971	466,657
Mar.	3,718,132	624,165	64,556	524,035
Apr.	3,429,121	599,427	61,539	631,220
May	3,862,491	594,253	59,060	553,756
June	4,409,006	615,271	62,703	605,733
July	3,716,739	543,726	47,203	513,394
Aug.	4,203,034	589,844	66,877	592,727
Sept.	4,472,219	680,660	71,198	637,400
Oct.	5,091,207	707,378	90,707	757,722
Nov.	4,803,615	709,764	74,382	691,078
Dec.	4,973,670	761,494	80,593	712,779
Total	50,242,746	7,725,970	821,388	7,152,726
1959				
Jan.	5,375,042	783,045	86,519	767,289

Index of Foundry Equipment Orders

Foundry Trades Only
(Net Orders Closed, New Equipment)

	1958	1959
Jan.	57.9	127.4
Feb.	57.6	237.1
Mar.	85.9	....
Apr.	88.7	....
May	136.1	....
June	87.7	....
July	77.9	....
Aug.	74.1	....
Sept.	64.5	....
Oct.	118.9	....
Nov.	83.3	....
Dec.	137.0	....

Note: Base period 1947-49 taken as 100 per cent monthly average.
Source: Foundry Equipment Manufacturers Association.



GRAY IRON CASTINGS—SHIPMENTS

(Net tons[1])

	All Castings — Total	All Castings — For Sale	Miscellaneous Castings Total	Miscellaneous Castings For Sale	Nodular Iron Castings Total	Heavy Steel Ingot Molds Total	Chilled Railroad Car Wheels Total	Pressure Pipe & Fittings Total[2]	Soil Pipe & Fittings Total[2]	Unfilled Orders[3]
1957										
Dec.	864,226	443,670	557,154	226,356	9,810	148,674	23,173	73,500	62,325	675,838
Total	12,664,504	6,876,497	7,786,229	3,310,915	.....	2,409,290	359,332	1,351,345	758,308	.....
1958										
Jan.	868,255	436,398	580,545	229,014	10,800	135,110	23,511	78,863	50,226	638,069
Feb.	753,396	389,708	503,175	203,717	10,245	116,168	25,959	67,606	40,398	632,490
Mar.	795,568	446,822	499,751	215,916	9,485	125,887	24,777	87,716	57,427	589,912
Apr.	806,726	457,498	483,999	210,344	8,015	121,489	25,401	112,292	63,539	562,446
May	820,054	472,192	469,026	203,025	5,671	134,312	23,498	123,017	70,201	570,293
June	867,948	541,904	503,252	245,651	5,773	135,477	22,928	129,671	76,620	572,706
July	791,560	465,650	430,882	185,275	3,999	157,478	19,928	116,790	72,481	580,155
Aug.	802,473	513,862	410,876	205,821	4,211	165,006	18,537	129,157	78,897	614,199
Sept.	916,704	537,717	518,185	227,414	4,622	175,323	20,783	125,693	76,720	644,834
Oct.	992,730	586,614	551,380	253,062	4,193	207,500	22,970	129,375	81,505	619,667
Nov.	958,306	505,290	575,586	231,669	3,426	201,704	18,801	98,326	63,889	602,375
Dec.	997,608	509,499	628,720	246,289	3,689	208,942	18,021	85,179	56,746	608,096
Total	10,371,232	5,863,154	6,155,377	2,657,197	74,129	1,854,396	265,134	1,277,685	788,479	.....
1959										
Jan.	1,001,771	517,390	625,604	250,161	4,103	214,985	27,650	75,571	58,056	687,245

*Source: U. S. Dept. of Interior, Bureau of Mines. [2]Source: Bureau of Census. [3]For sale only. [4]All cast iron pipe is shipped for sale.

cludes a building addition and an automatic sand and mold handling system.

FOUNDRY MAINTENANCE: An engineering Institute on "Foundry Maintenance and Management" will be held at the University of Wisconsin, June 2-3. Discussion topics will include maintenance of major foundry equipment and the initiation and management of a preventive maintenance program. The fee is $20. Other details are obtainable from Richard A. McCormick, institute co-ordinator, 4016 Stadium, University of Wisconsin, Madison 6, Wis.

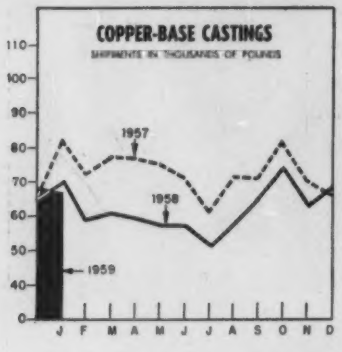
ASF SELLS PLANT: Verona, Pa., plant of American Steel Foundries has been sold to Specialty Steel Products Inc., East Pittsburgh. The latter, which will take possession June 1, operates another steel foundry at Braddock, Pa.

TO CONTINUE FOUNDRIES: International Harvester Co. plans to discontinue farm implement production over a three-year period at its large but obsolete McCormick Works in Chicago. Some foundry operations will be maintained, however, employing about 500 people. Castings production will continue in the nodular iron foundry. Some operations will be carried on in the present malleable iron foundry, with other production transferred to Waukesha, Wis.

NCC ELECTS: Ross L. Gilmore, president, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., was elected president of the National Castings Council at a meeting in Chicago, April 16. Other officers elected are Albert M. Nutter, treasurer, E. L. LeBaron Foundry Co., Brockton, Mass., vice president; Frank G. Steinebach, editor, *Foundry*, secretary, and F. Ray Fleig, president, Smith Facing & Supply Co., Cleveland, treasurer.

DUCTILE IRON SOCIETY: First officers and directors were elected by the new Ductile Iron Society at a recent meeting in Chicago. Robert S. Thompson, president, H. P. Deuscher Co., Hamilton, Ohio, was named president. Other officers are William Beatty, vice president, Morris Bean & Co., Yellow Springs, Ohio, vice president; R. K. Guise, metallurgist, Kuhns Brothers Co., Dayton, Ohio, secretary-treas-

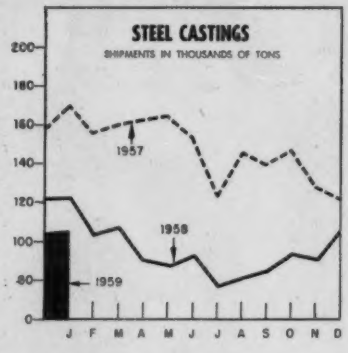
Foundry Statistics



COPPER-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—Sand	Shipments—Perm. Mold	Unfilled Orders[2]
1957				
Dec.	65,685	59,580	3,049	31,553
Total	874,627	789,014	44,789	.....
1958				
Jan.	69,707	63,294	3,327	30,341
Feb.	58,356	52,579	3,202	27,243
Mar.	60,157	54,097	3,395	25,434
Apr.	59,311	53,271	3,385	25,621
May	57,506	51,634	3,077	22,867
June	57,124	51,967	3,001	21,578
July	51,124	46,636	2,351	20,518
Aug.	57,790	52,981	2,425	24,851
Sept.	64,447	58,435	2,888	25,655
Oct.	74,012	67,564	3,239	26,726
Nov.	62,746	57,386	2,604	24,928
Dec.	67,905	61,119	3,535	25,078
Total	740,155	670,873	36,429	.....
1959				
Jan.	66,874	59,856	3,572	25,344



STEEL CASTINGS—SHIPMENTS

(Net tons[1])

	All Castings—Total	All Castings—For Sale	All Castings—Railway Specialties	Carbon—Total	Carbon—For Sale	Carbon—Railway Specialties	Alloy—Total	Alloy—For Sale	Alloy—Railway Specialties	Unfilled Orders[2]
1957										
Dec.	120,787	92,125	23,403	88,101	66,468	21,808	32,686	25,657	1,595	327,337
Total	1,766,191	1,359,747	349,059	1,328,478	1,019,090	324,951	437,713	340,657	24,106	.....
1958										
Jan.	120,722	94,717	22,545	87,525	65,203	21,115	33,197	26,514	1,430	304,907
Feb.	103,297	79,708	16,647	74,283	56,781	15,273	29,014	22,927	1,374	282,358
Mar.	106,233	82,195	16,180	77,564	60,208	15,240	28,669	21,987	940	252,840
Apr.	91,464	69,121	11,956	65,639	48,998	11,107	25,825	20,123	849	229,503
May	87,002	66,066	10,416	61,105	45,967	9,463	25,897	20,119	953	211,346
June	92,861	71,624	14,185	67,227	50,919	12,987	25,634	20,705	1,198	190,779
July	68,802	48,618	5,400	46,858	32,161	4,656	21,944	16,457	744	200,272
Aug.	80,886	59,816	8,021	57,539	42,069	7,090	23,347	17,747	931	196,300
Sept.	85,277	64,586	9,205	60,392	44,890	7,905	24,885	19,696	1,300	196,482
Oct.	95,389	73,367	12,254	67,906	51,065	10,980	27,483	22,302	1,274	184,925
Nov.	85,267	65,788	9,643	59,793	45,808	8,501	25,474	19,980	1,147	193,960
Dec.	103,800	81,360	13,187	76,015	59,171	11,934	27,785	22,189	1,253	214,352
Total	1,211,000	856,986	149,644	801,846	606,240	136,251	319,254	250,716	10,393	.....
1959				76,242	59,027	12,948	29,150	23,656	1,460	232,646
Jan.	105,392	82,683	14,408							

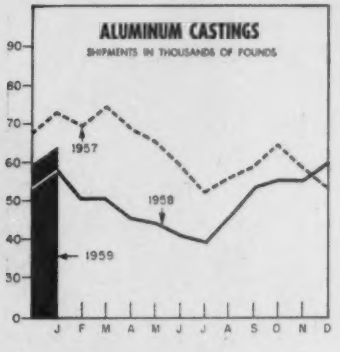
[1]Source: Bureau of Census. [2]For sale only.

urer, and James H. Lansing, castings consultant, Cleveland, executive secretary. Headquarters address of the society is P. O. Box 858, Cleveland 22, Ohio.

OBITUARY: Col. Merrill G. Baker, executive vice president of the Steel Founders' Society of America from 1933 until his retirement in 1946, died April 11 in Mill Valley, Calif.

PERSONALS: William A. Mader has been named vice president, technical services, Oberdorfer Foundries Inc., Syracuse, N. Y. . . . F. L. Robertson has been made vice president and sales manager, Keokuk Steel Casting Co., Keokuk, Iowa, and Jack Dimond has been appointed executive vice president of its associated Mid-Continent Steel Casting Corp., Shreveport, La. . . . Richard B. Courchene, vice president, Dayton Malleable Iron Co., Dayton, Ohio, has also been named president of its subsidiary, Meta-Mold Aluminum Co., Cedarburg, Wis. . . . Philip A. Newhart, formerly with Koppers Co., Baltimore, has been appointed metallurgical engineer for the pig iron and coal chemicals sales division, Republic Steel Corp., Cleveland . . . Carl W. Kendall has been made plant superintendent, Clearfield Machine Co., Clearfield, Pa., and Terrence O'Donnell has succeeded his father, Thomas E. O'Donnell Sr., as foundry foreman.

MISCELLANY: A recent report indicates that National Malleable & Steel Castings Co. will reopen its Indianapolis plant during the third quarter . . . Werner Foundry & Machine Co., Lansdale, Pa., has leased the former Carver Foundry near Norristown, Pa., for production of gray iron castings . . . Foundry Equipment Ltd., Leighton Buzzard, England, has set up its fourth overseas company, Foundry Equipment (South Africa) (Pty) Ltd., in Johannesburg, South Africa . . . Management personnel of Federal Malleable Co., West Allis, Wis., has purchased the company and will continue operations under the corporate name of Federal Malleable Co. Inc. . . . Midland-Ross Corp., Cleveland, has acquired Nelson Metal Products Co., Grand Rapids, Mich., producer of automotive diecastings . . . Diamond Alkali Co., Cleveland, will build a multimillion-dollar research center near Painesville, Ohio.



PRODUCTION WORKERS

Estimated Number

	Jan. 1959	Dec. 1958	Jan. 1958
Ferrous	211,000	208,200	217,600
Nonferrous	62,500	62,100	61,700

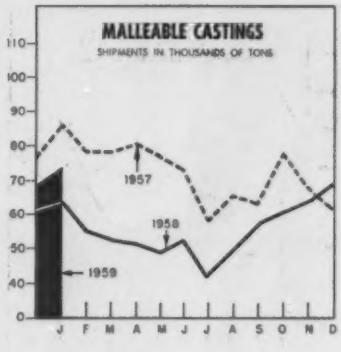
Average Weekly Earnings

Gray Iron	$93.38	$92.28	$78.72
Malleable Iron	92.28	96.87	81.09
Steel	100.40	98.60	91.20
Nonferrous	98.40	98.95	90.25

Average Weekly Hours

Gray Iron	39.4	39.1	35.3
Malleable Iron	39.1	40.7	36.2
Steel	40.0	39.6	38.0
Nonferrous	41.0	41.4	38.9

Source: Bureau of Labor Statistics.



ALUMINUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments				Unfilled Orders[2]
	Total	Sand	Perm. Mold	Die	
1957					
Dec.	53,084	9,284	16,724	26,978	86,323
Total	751,818	143,991	232,326	373,586	.....
1958					
Jan.	57,845	10,724	18,082	28,937	77,067
Feb.	50,695	9,601	15,456	25,279	75,647
Mar.	50,547	9,311	15,255	25,918	63,600
Apr.	44,948	9,531	13,369	21,956	60,317
May	44,093	9,312	13,648	21,091	59,666
June	40,701	8,644	13,679	18,292	63,670
July	38,818	8,658	12,342	17,714	68,618
Aug.	45,034	9,034	14,426	21,505	71,135
Sept.	52,796	10,261	16,241	26,254	72,819
Oct.	55,699	10,932	17,189	27,511	73,474
Nov.	55,793	10,539	16,942	28,264	76,370
Dec.	59,487	10,874	18,970	29,579	78,732
Total	596,456	117,421	195,599	292,300	.....
1959					
Jan.	62,927	10,907	20,606	31,349	83,314

[1]Source: Bureau of the Census. [2]For sale only.

MALLEABLE IRON CASTINGS

(Shipments of castings—net tons[1])

	Shipments		Standard		Pearlitic		Unfilled Orders[1]
	Total	For Sale	Total	For Sale	Total	For Sale	
1957							
Dec.	80,425	34,343	48,694	27,218	11,731	7,125	74,863
Total	862,976	520,118	713,539	431,652	149,437	88,456	.....
1958							
Jan.	62,734	34,920	51,440	28,516	11,294	6,404	67,292
Feb.	54,650	31,006	45,419	25,381	9,231	5,625	59,047
Mar.	51,708	29,624	43,368	24,333	8,340	5,291	54,330
Apr.	50,695	29,388	41,794	23,605	8,901	5,783	47,664
May	48,306	26,656	40,092	21,710	8,214	4,946	46,603
June	51,882	31,077	42,910	25,679	8,972	5,398	48,260
July	41,865	24,479	33,857	20,023	8,008	4,456	58,340
Aug.	49,252	29,414	41,734	24,696	7,518	4,718	56,145
Sept.	56,836	31,999	45,945	26,370	10,891	5,629	58,405
Oct.	60,981	40,014	50,181	31,992	10,800	8,022	63,425
Nov.	63,356	35,221	50,963	28,409	13,293	6,812	66,725
Dec.	68,385	40,041	53,797	32,883	14,588	7,156	66,725
Total	660,640	382,839	540,660	313,597	129,066	79,242	.....
1959							
Jan.	73,186	43,667	56,700	35,139	16,486	8,528	77,322

Prices of Foundry Metals and Coke

(As of May 1, 1959)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$18.00-18.50

OVEN	
Birmingham	$30.35
Buffalo	32.00
Detroit	32.00
Erie, Pa.	32.00
Indianapolis	31.25
Kearny, N. J.	31.25
Milwaukee	32.00
Neville Island (Pittsburgh)	30.75
New England, deld.	33.55
New Haven, Conn.	31.00
Painesville, O.	32.00
Philadelphia	31.00
St. Louis	33.00
St. Paul	31.25
Swedeland, Pa.	31.00
Terre Haute, Ind.	31.25

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$68.50	$69.00
Birmingham	62.50	66.50
Buffalo	66.50	67.00
Chester, Pa.	68.50	69.00
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Everett, Mass.	68.00	68.50
Fontana, Calif.	75.50	....
Geneva, Utah	66.50	....
Granite City, Ill.	66.40	66.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	68.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	68.50	69.00
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 30.25; tin bronze, No. 225, 41.25; No. 245, 35.00; high-leaded tin bronze, No. 305, 34.50; No. 1 yellow, No. 405, 24.75; manganese bronze, No. 421, 27.75.

ALUMINUM: 99 per cent plus primary ingots 26.80. Secondary No. 12 alloy, 21.75-22.00. Deoxidizing grades: No. 1, 23.75; No. 4, 19.75.

MAGNESIUM: 99.8 per cent notched ingots 36.00, f.o.b. Velasco, Tex. (10,000 lb or more).

COPPER: Electrolytic 31.50, delivered Connecticut valley.

ZINC: High grade 12.00, delivered. Die casting alloy No. 3, 13.50; No. 2, 14.00, delivered.

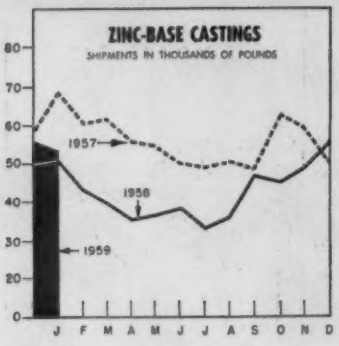
IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$30.00-31.00	$53.00-54.00	.....	.....	.....	.....	$49.00-50.00
Boston*	**26.00-27.00	**33.00	.....	.....	**34.00	.....	.....
Buffalo	32.00-33.00	**46.00-47.00	.....	.....	**50.00-51.00	.....	49.00-50.00
Chicago	34.00-35.00	45.00-46.00	.....	52.00-53.00	52.00-53.00	56.00-57.00	52.00-54.00
Cincinnati*	**34.00-35.00	**43.00-45.00	**39.00-40.00	.....	**48.00-49.00	.....	**54.00-55.00
Cleveland	33.00-34.00	47.00-48.00	38.00-39.00	50.00-51.00	50.00-51.00	65.00-66.00	57.00-59.00
Detroit*	**26.00-27.00	**39.00-40.00	**31.00-32.00	**43.00-44.00	.....	.....	.....
Los Angeles	38.00	47.00	.....	.....	.....	.....	.....
New York*	26.00-27.00	36.00-37.00	34.00-35.00	.....	.....	.....	.....
Philadelphia	33.00-34.00	41.00	43.00	.....	49.00-50.00	67.00-68.00	.....
Pittsburgh	36.00-37.00	45.00-46.00	.....	46.00-47.00	51.00-52.00	.....	57.00-59.00
St. Louis*	34.00	50.00	40.00	56.00	.....	.....	.....
San Francisco	26.00	44.00	28.00	40.00	40.00	.....	.....
Seattle	37.00	34.00	28.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

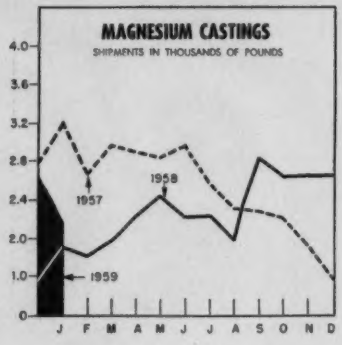
Foundry Statistics



PIG IRON

PRODUCTION*—Net Tons

	Foundry	Malleable & Silvery	Low & Int. Low Phos. & Bessemer
1957	2,275,789	3,697,335	7,452,203
1958			
Jan.	160,097	232,802	415,859
Feb.	106,921	193,429	319,094
Mar.	156,386	227,785	389,254
Apr.	136,180	173,139	424,954
May	127,438	165,045	396,009
June	121,869	167,192	342,617
July	123,075	156,582	402,850
Aug.	141,185	145,216	396,511
Sept.	133,556	234,752	416,026
Oct.	146,386	257,111	575,806
Nov.	175,210	257,131	489,095
Dec.	154,007	272,375	429,299
Total[3]	1,622,320	2,448,917	4,954,854
1959			
Jan.	190,392	263,105	479,019
Feb.	121,716	258,250	312,284
Mar.	173,881	341,218	412,533



ZINC-BASE CASTINGS

(Shipments of castings—1000 pounds[2])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1957			
Dec.	50,112	30,513	58,583
Total	569,775	431,509	.....
1958			
Jan.	50,568	30,388	55,883
Feb.	42,687	27,482	50,676
Mar.	39,719	26,782	43,366
Apr.	35,796	23,830	27,634
May	36,447	24,588	33,438
June	38,132	25,993	34,888
July	32,765	22,843	41,534
Aug.	35,860	26,971	45,066
Sept.	47,127	33,520	50,762
Oct.	45,045	36,103	58,154
Nov.	48,431	34,054	57,864
Dec.	55,600	39,768	56,756
Total	508,177	352,302	.....
1959			
Jan.	53,347	37,887	61,192

CONSUMPTION*—Gross Tons

	Cupola	Air	Electric
1957	4,160,891	218,178	246,851
1958			
Jan.	306,794	16,102	14,426
Feb.	260,940	14,014	7,740
Mar.	270,214	13,472	8,753
Apr.	262,007	13,975	9,585
May	256,204	12,001	11,764
June	262,883	12,098	15,549
July	239,140	10,550	12,140
Aug.	247,428	13,196	32,309
Sept.	300,173	14,994	27,759
Oct.	300,115	17,393	34,273
Nov.	287,013	14,862	31,397
Dec.	321,741	16,610	25,450
Total	3,314,652	169,267	231,145
1959			
Jan.	321,302	17,113	36,783

MAGNESIUM CASTINGS

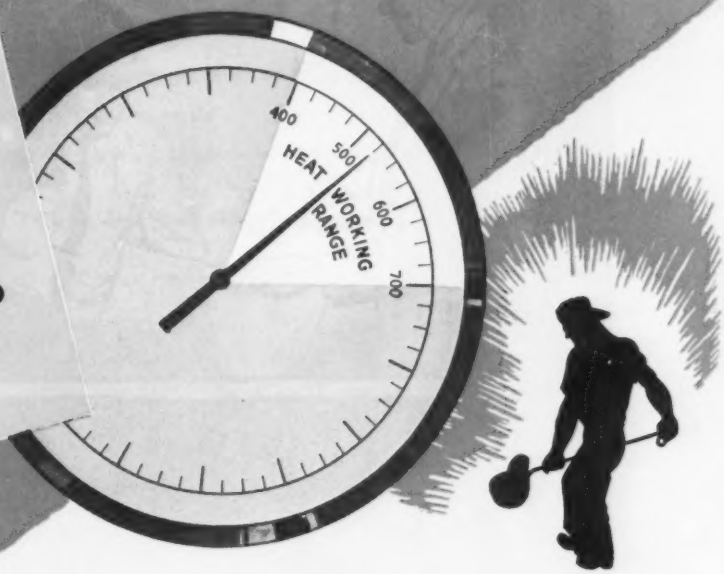
(Shipments of castings—1000 pounds[2])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1957			
Dec.	1,533	1,408	4,823
Total	30,322	28,452	.....
1958			
Jan.	1,881	1,756	5,227
Feb.	1,803	1,730	5,589
Mar.	1,975	1,860	5,555
Apr.	2,215	2,141	5,555
May	2,422	2,196	5,200
June	2,205	1,996	5,515
July	2,200	2,063	6,706
Aug.	1,869	1,808	6,086
Sept.	2,804	2,581	6,083
Oct.	2,627	2,479	5,463
Nov.	2,615	2,523	4,063
Dec.	2,612	2,384	5,115
Total	27,228	25,517	.....
1959			
Jan.	2,151	2,044	5,001

*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only. [3]Monthly figures do not add up to totals shown because of unreported monthly revisions.

Whitehead's NEW DUO RESIN* BINDER

● with controlled oven temperature you can profit by the advantages of our latest lab development.



After three years of laboratory research and field testing, Whitehead is now ready to supply DUO RESIN Binder to progressive foundries for dry sand molding. It is a laboratory controlled product designed to replace pitch. DUO RESIN Binder affords all the desirable properties of pitch; in addition, it gives a consistently strong bond and offers the following highly desired advantages:

1. **EASY SHAKEOUT** — DUO RESIN Binder makes shakeout easy because it burns out while metal is cooling.
2. **BETTER CASTING FINISH** — Permits full benefit of blacking penetration since it does not waterproof sand.
3. **ECONOMICAL** — Promotes economy by saving up to 50% of dry binder, requiring less handling, less storage, less transportation. Takes lower baking temperatures, saving fuel, too.
4. **SIMPLIFIES OPERATION** — Because it eliminates need of blending with other compounds to achieve the desired results.
5. **NON-IRRITATING** — Of bland chemical composition, DUO RESIN is non-irritating.
6. **TESTED AND PROVED** — It has been tested and proved safe in foundry after foundry.

Try DUO RESIN Binder!
Order a trial quantity today.

****For details ask for literature or consult our representative.***

Whitehead Brothers COMPANY

Established 1841

NEW YORK OFFICE
324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
75 Westminster St., Providence 1, R. I.

Manufacturers of:

LYQUAGRIP
Ready-to-use core paste

DOB-IT
Ready-to-use core mudding compound

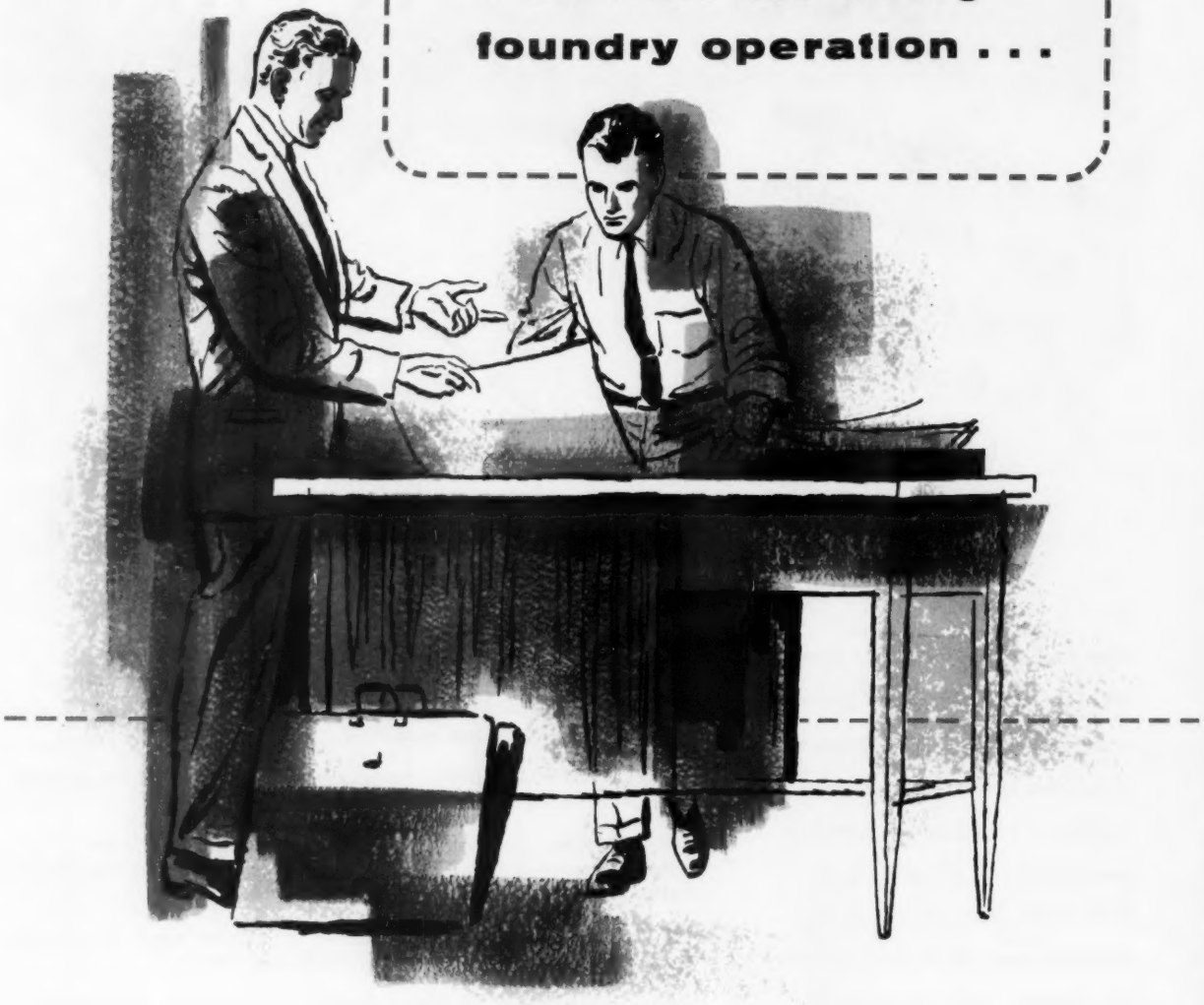
JOINT-SEAL
Plastic compound for perfect sealing

LYQUAFLOUR
For cleaner surface, better shakeout

LYQUAFACE
The liquid sand grain coating

Circle 579 on Page 53

a type and size molding machine for every foundry operation . . .



Today, foundries want high-speed efficient operation, with flexibility in the variety of castings they can produce.

To achieve this end result, we have developed a variety of 14 different types of Standard and Special machines.

One of the outstanding examples of our high-speed molding equipment is the versatile "Stationmaster" jolt squeeze strip and jolt squeeze rollover machines.

These Stationmasters are automatic two-station indexing machines which can produce castings in a wide range of types and sizes.

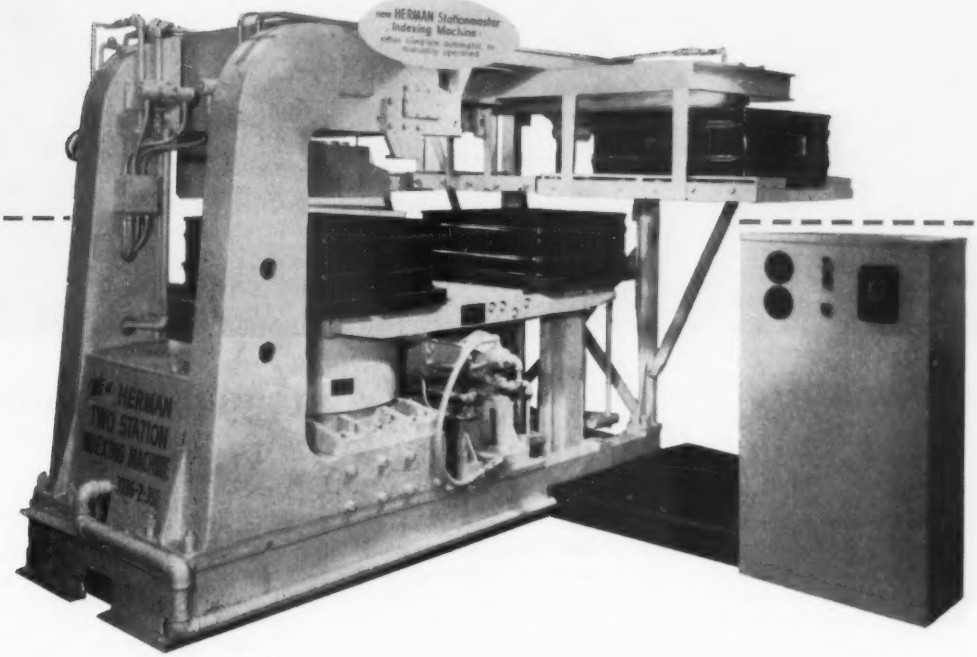
HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.

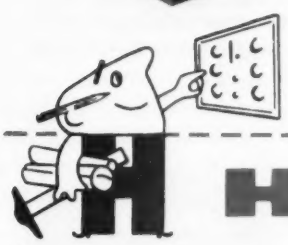
The advantages of the "Stationmaster" are:

1. **Proper jolt insured by adjustable Bunter Control Valve and Timing Device.**
2. **Squeeze pressures adjustable from minimum to maximum.**
3. **Adjustable strike-off.**
4. **Retractable squeeze heads permit direct sand filling through measured sand hoppers mounted on squeeze head supports.**
5. **Squeeze piston provided with limit stop.**
6. **Adequate registrations insure accurate location of flask at all positions.**
7. **Jolting, squeezing pneumatically operated.**
8. **Other operations controlled by proven pneumatic hydraulic application to insure fast, smooth, positive action.**

These and other outstanding molding machines stem from Herman's policy of "looking to the future."

If you are looking to the future, or if you have immediate requirements for molding equipment, call us today.





HERMAN

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

and most progressive

Best Known Name In Engineered Molding Machines

Circle 580 on Page 53

DESULPHURIZATION...

LINDE's desulphurization method, for use with calcium carbide, is simple, efficient, and economical. The principal parts, shown here, are nitrogen supply, dispenser, and injection tube.

You get uniform results with Metallurgical Carbide from LINDE

In the foundry, you can produce high grade iron only by making sure you use metal with a low sulphur content. As a desulphurizing agent, metallurgical calcium carbide assures *uniformity* in the metal you produce. You know in advance that by adding a certain amount of carbide you remove a certain percentage of sulphur. Because metal specifications can be met efficiently and economically with carbide, you eliminate any need for wasteful "trial and error" methods.

Linde's method of mixing UNION calcium carbide and molten iron is simple and sure. A stream of fine mesh carbide and nitrogen under pressure is forced from a dispenser through a hose. The graphite injection tube is immersed deep in the hot metal. The carbide blends evenly and thoroughly with the iron. Desulphurization with UNION calcium carbide creates no fumes, does not attack refractories. The LINDE equipment—nitrogen supply, dispenser, and injection tube—is easy to operate and maintain.

If you would like more information about LINDE's method of desulphurization, using calcium carbide, just call or write your nearest LINDE office. LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. Offices in other principal cities. In Canada: Linde Company, Division of Union Carbide Canada Limited.

Linde
TRADE-MARK

UNION CARBIDE

The terms "Linde," "Union" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

Circle 581 on Page 53

NATIONAL MOLDER'S HELPER

It's an "Elevayor"

This unique National-patented equipment item will deliver a full mixer batch from discharge door to bin within 20-30 seconds. Can be designed to receive charge from front end loader too. Shoveling or extra handling is *completely* eliminated.

Use it with any Mix-Muller

You've already cut your costs if you're now a Mix-Muller user! Molder's Helper can be used with any Model Mix-Muller (1F to 2½F)

Molder's Helper with 1½F Mix-Muller handles 1000 lb. batch. Is equipped with two 50 cu. ft. hoppers.

It's an aerator!

Upper section of "Elevayor" automatically aerates sand. Another step eliminated, another item of equipment and labor that's *built-in* with this low cost mechanized National "package" unit.

It's overhead sand

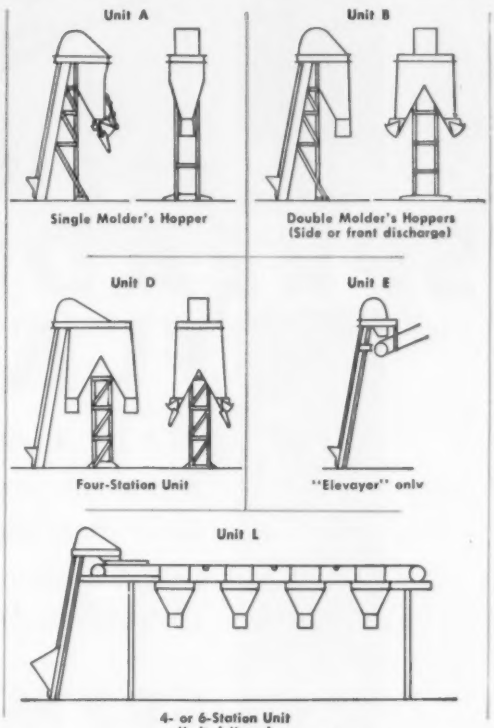
Sturdy, NATIONAL Molder's Hoppers receive fluffy, aerated free-flowing sand ready for molding — in seconds. Units available for 2, 4 or 6 molders stations. Riddling and shoveling are eliminated to cut molder's time up to 50%.

It's National Quality

The Molder's Helper is a *foundry* proven item. Its design, fabrication and performance characteristics reflect the same quality of workmanship that is found in all National-engineered components.

Many arrangements possible

Other arrangements available to suit specific requirements.



Now any foundry can afford to have overhead sand!

The National Molder's Helper is designed to eliminate the costly time and labor consuming job of hauling sand from mixer to molder. With it, you can bring overhead sand to the smallest operation; *increase* molders production up to 50%; *eliminate* floor shoveling and *concentrate* your entire mixing and molding operation into no more floor space than one molder now occupies.

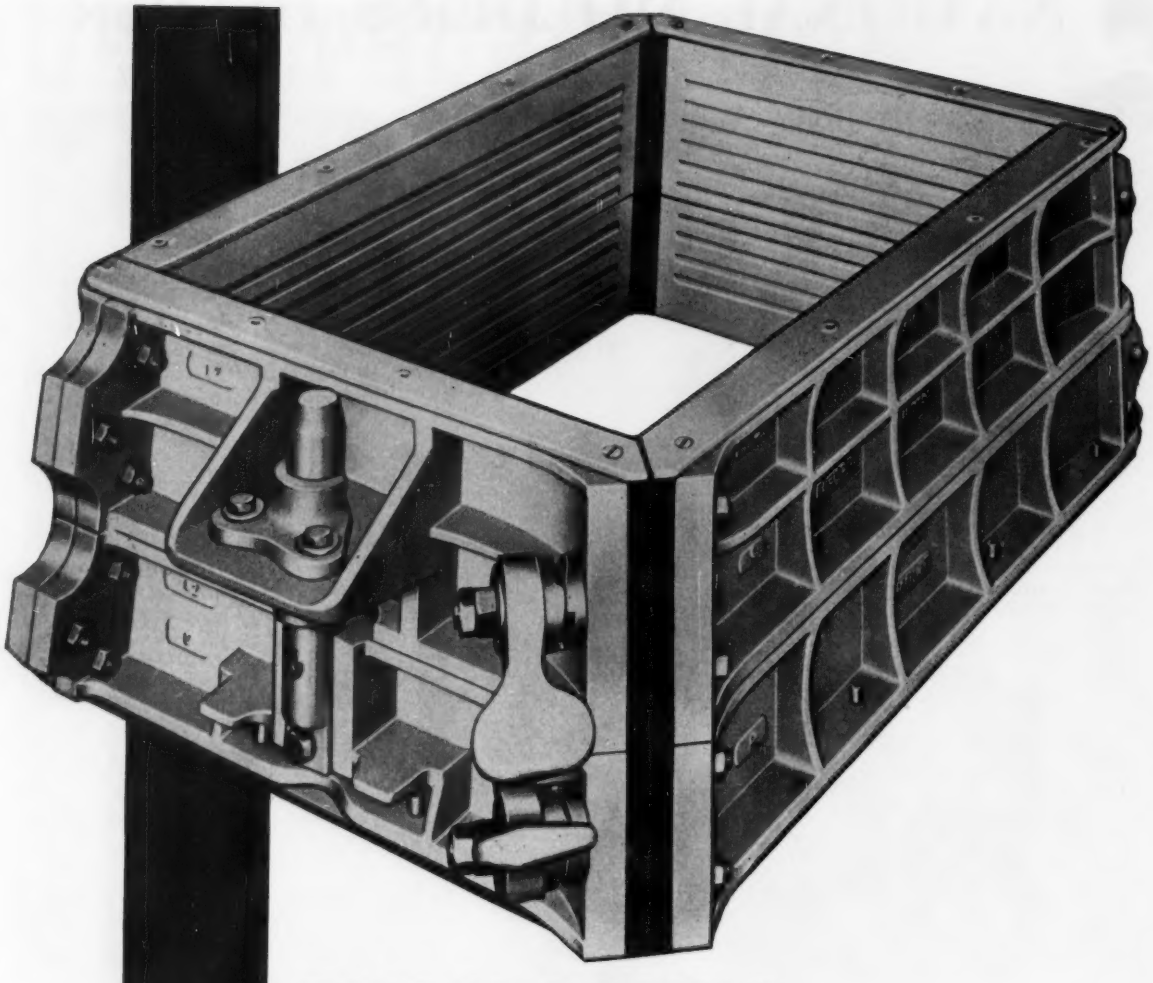
Cold hard *dollars* saved in increased efficiency, lower labor costs and better, more flowable sand—can quickly pay the small cost of the Molder's Helper. *But what's more* any foundry with a Simpson Mix-Muller already has a head start in equipment. Write for further details today, or let your man from NATIONAL give you an estimate.

NATIONAL ENGINEERING COMPANY

646 Machinery Hall Bldg.
Chicago 6, Illinois

ANOTHER! PROVEN PRODUCT OF THE PRACTICAL FOUNDRYMAN BY NATIONAL

Circle 582 on Page 53



FREMONT'S SPREADLOCK FLASKS

This is a personal note from the manufacturer to inform you that these accurately machined flasks have tremendous corner strength. They are made of magnesium.....cams are hardened steel forgings. Spreadlock Flasks available in all convenient sizes.....

FREMONT FLASK CO.

FREMONT, OHIO

Circle 582 on Page 53

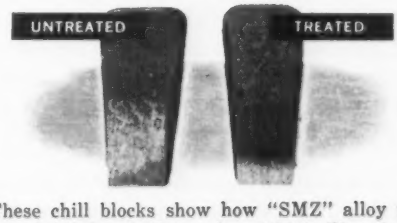
"No machining complaints since I used SMZ alloy"

You can eliminate chilled corners and hard spots in gray iron castings with ladle additions of "SMZ" alloy. Machining rates can thus be improved by as much as 25 per cent, giving you more satisfied customers.

"SMZ" alloy is the most widely used inoculant in the iron foundry industry. As little as 2 to 4 pounds of "SMZ" alloy per ton of iron are sufficient to eliminate chill in light castings. For harder irons of lower carbon and silicon contents, a larger addition of the alloy may be required.

For information on how "SMZ" alloy can improve the machineability of your castings, contact your UNION CARBIDE METALS representative. Ask for the booklet, "SMZ Alloy – An Inoculant for Cast Iron."

UNION CARBIDE METALS COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y.



These chill blocks show how "SMZ" alloy reduced chill in a 3.15% carbon, 1.80% silicon iron.

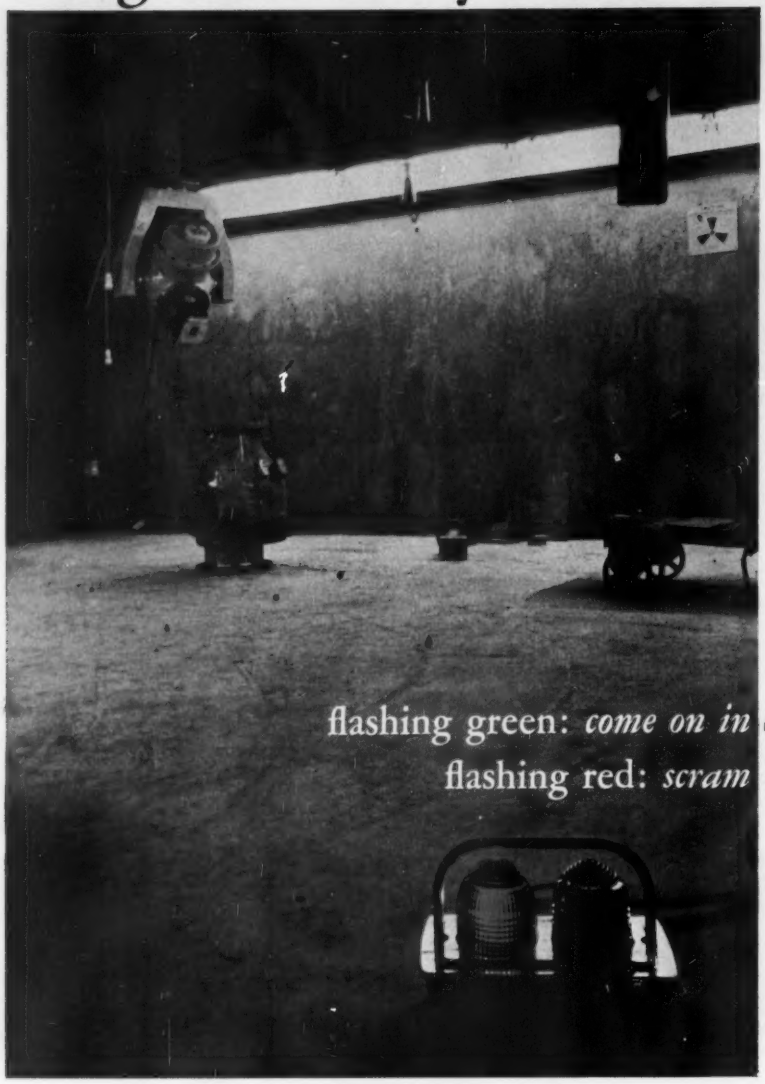
UNION CARBIDE METALS

Electromet *Brand Ferroalloys and other Metallurgical Products*

The terms "Electromet," "SMZ," and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

Circle 584 on Page 53

using radiation? you need GAMMALARM



Anyone using radiation needs GAMMALARM.
And if you're using radioisotopes the A.E.C.* says you must have one (or equivalent).

GAMMALARM stands constant watch; flashes warning the instant radiation rises above a safe level in the guarded area. Warning can go as far beyond the flashing red light as deemed necessary: GAMMALARM can be rigged to set off a clamorous din of bells, sirens—can even throw safety locks on access doors in the radiation area.

GAMMALARM responds directly to a radiation level as low as 2 mr per hour. Or it can be preset to give warning at any elected "safe" level over that up to 400 mr per hour. Depends, of course, on the nature of the job in hand.

**Title 10, Atomic Energy, Chapter 1, A.E.C. Part 70*

Incidentally, that's a Picker Cyclops Cobalt 60 radiography unit you see in the background. Just installed at Cooper-Alloy Foundry in Hillsdale, N. J., it's probably the most powerful in use in America today. Its 1000 curies of Cobalt 60 radiograph heavy stainless steel valves and fittings in a hurry: a six-inch thickness takes only 15 minutes.

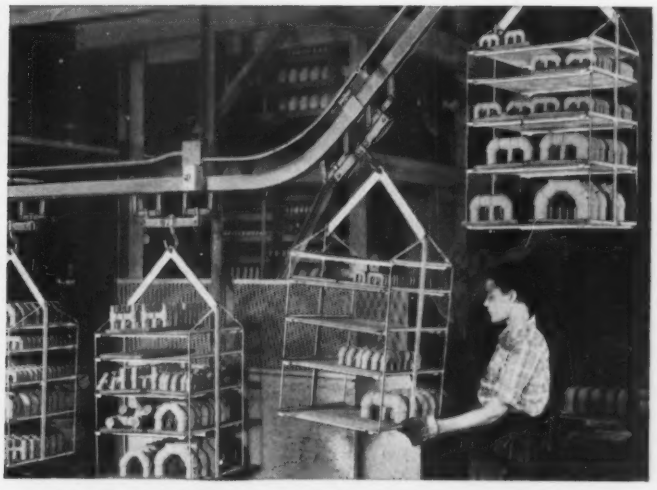
GAMMALARM is no bigger than a lunch box and weighs hardly more (12 lbs.). Operates off any 115 volt AC line. Hermetically watertight, it works equally well indoors, outdoors, rain or shine. Costs only $325 complete. Call your local Picker representative (see 'phone book) or write or wire Picker X-Ray Corporation, 25 South Broadway, White Plains, N. Y.

Picker x-ray

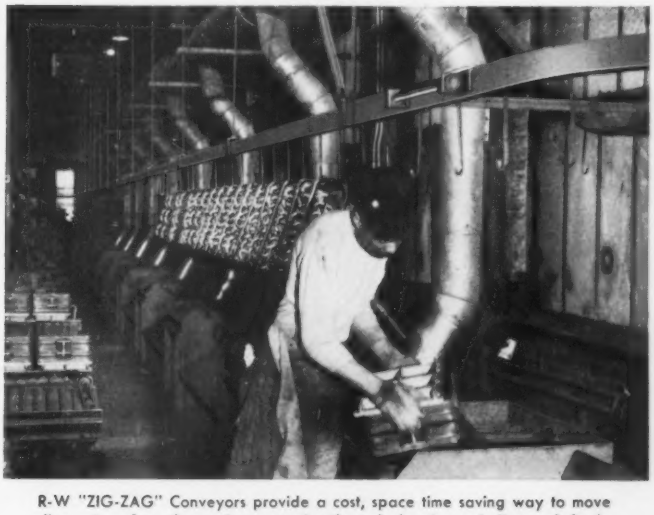
Circle 585 on Page 53

CONVEY CORES & CASTINGS OVERHEAD ...SWIFTLY SAFELY & ECONOMICALLY WITH R-W "Zig-Zag"®

CONTINUOUS POWER CONVEYORS



Cores may be efficiently moved to and from the baking ovens and then on to checking benches via an R-W "ZIG-ZAG" Conveyor. Eliminates hazardous lifting and danger of costly breakage.



R-W "ZIG-ZAG" Conveyors provide a cost, space time saving way to move die castings from the casting operation through cleaning, grinding and checking stations and on to shipping. Smooth continuous product flow speeds-up production; eliminates costly bottle-necks.

Speed-up production, cut handling costs, eliminate breakage and increase profits with an R-W "ZIG-ZAG" Conveyor. Unit loads of up to 125 lbs. are carried up, down, in, out and around at a speed to meet your particular requirement. They are strong, flexible, efficient and safe... all moving parts of the chain are fully enclosed and protected from dirt and dust. "ZIG-ZAG" conveyors are economical to purchase... economical to operate and maintain... economical to install. May be installed and later expanded or altered by plant personnel. Write today... request Catalog A-93R.

FOR FAST, SAFE LADLE HANDLING

Reduce handling costs safely and speed-up production with R-W Crane and Monorail Conveyor Systems. Whether you need a single unit for a specific job or a complete system, R-W cranes and Monorail Conveyors provide smooth, safe ladle handling plus 100% utilization of the pouring area. Transfer cranes with safety interlocks at transfer points provide flexibility and easy handling throughout pouring operations. Let an R-W Sales-Engineer show you how R-W equipment can save you time, money and maintenance costs. Write today for complete information.

Richards-Wilcox
MANUFACTURING COMPANY
"MATERIAL HANDLING DIVISION"

466 W. THIRD STREET, AURORA, ILL. Branches in Principal Cities

Circle 586 on Page 53

Speed production of grey iron castings

EXCELLENT FLOWABILITY of Dexocor binder sand mix gives uniform structure throughout cores—and draws are made easily without sticking.

A large midwestern grey iron foundry finds that:

*"Cores made with Dexocor baked through in 40 to 50 per cent less time—saving fuel dollars and permitting more flexible production scheduling. In addition, green cores, even with high stands or overhang, held perfect shape. Cracking of cores, gas defects and metal penetration were virtually eliminated."

—Dexocor offers other advantages: Better moisture control, excellent flowability, quick, easy mixing, blowing, ramming, easy shake-out—especially when used with Mogul or Kordek binder.

Ask for detailed information and technical help in utilizing this new miracle binder. Contact our nearest sales office.

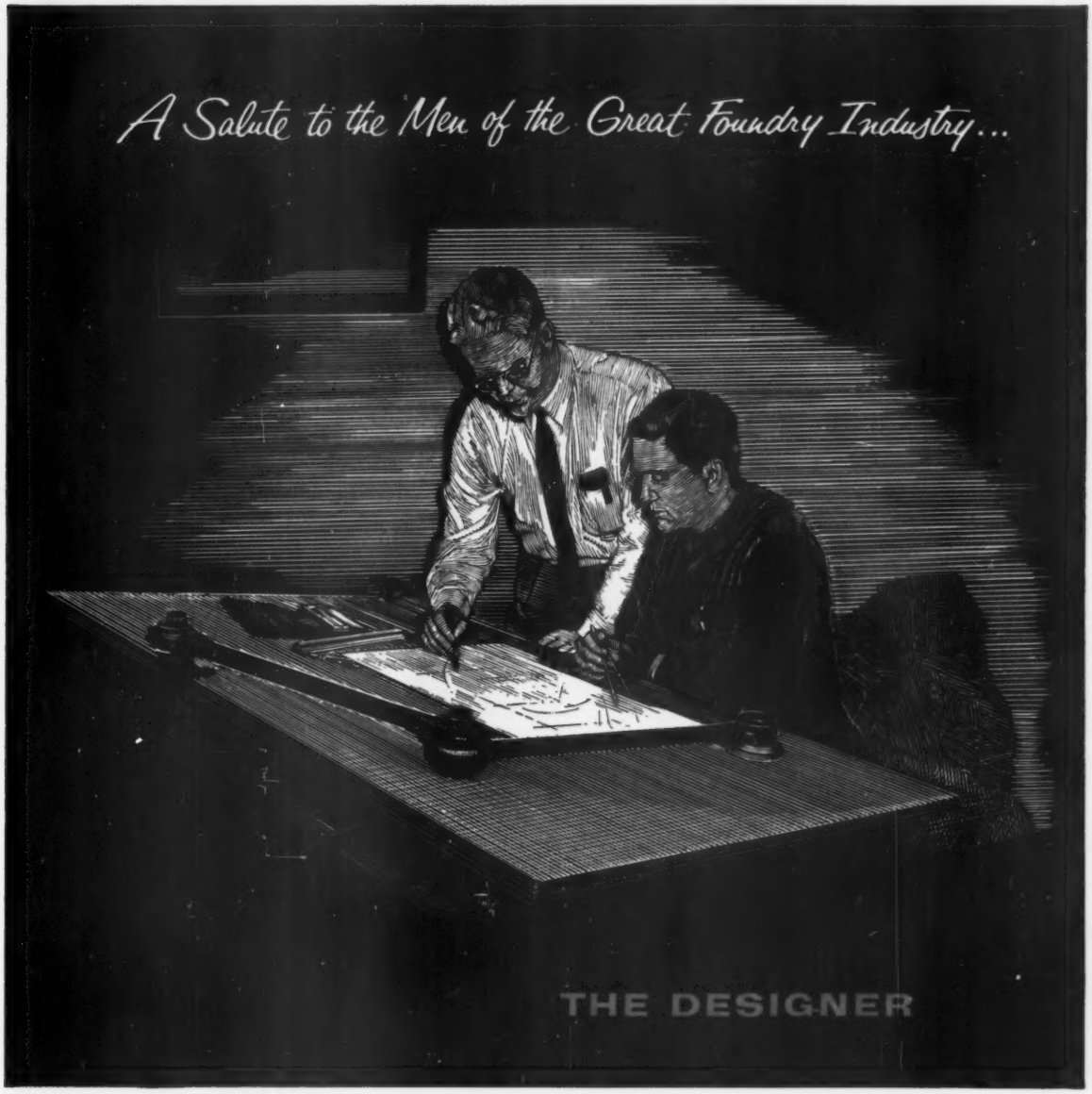
*Source on request.

DEXOCOR® Binder

Other fine products for the Foundry Industry: MOGUL® and KORDEK® Binders • GLOBE® Dextrines

CORN PRODUCTS SALES COMPANY 17 BATTERY PLACE, NEW YORK 4, N.Y.

A Salute to the Men of the Great Foundry Industry...



THE role of the Designer is one of far-reaching significance in the foundry industry. In addition to his ability to supervise the design and specifications of castings, he must have a thorough knowledge of the properties of the iron and the casting techniques to be used, the service conditions of the castings, and other factors such as the quality, cost and appearance of the finished castings.

Pittsburgh Coke and Chemical is proud to salute the gray iron foundry Designer. It is equally proud to serve as a basic supplier of two quality products for the nation's foundry trade . . . NEVILLE Pig Iron and NEVILLE Foundry Coke.

An enlarged (11½" x 11") reproduction of the above etching, suitable for framing, will be sent without cost upon request. Similar etchings from the previous ads of this series, featuring the Pattern Maker, the Molder, the Melter and the Metallurgist, are also available.

Neville Pig Iron and Neville Coke for the Foundry Trade

PIG IRON • COKE • FERROMANGANESE • CEMENT • COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON

Circle 588 on Page 53

LET'S LOOK at

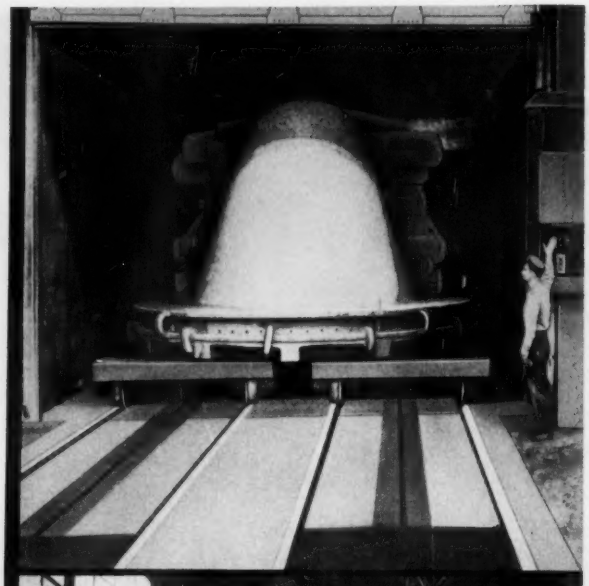
OVENS for every baking requirement

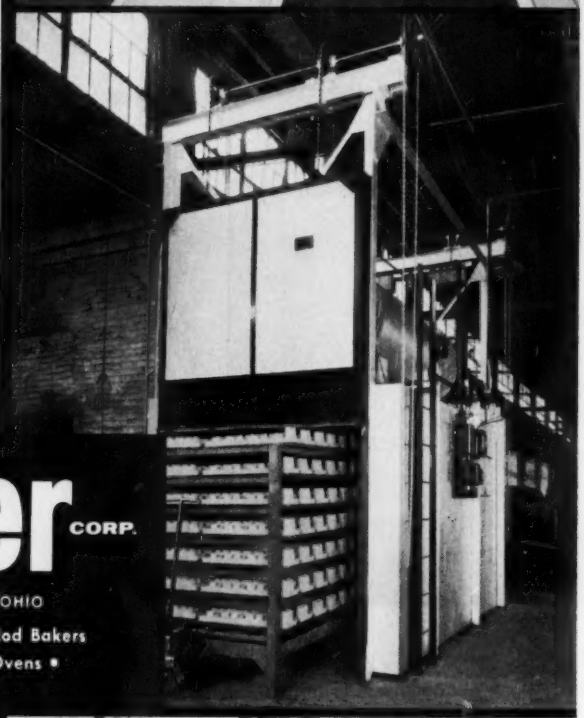
OVENS that will be faster and less expensive to operate

OVENS that are designed to best fit your operation

Carl Mayer designs and manufactures all types of ovens as well as "specials" to meet unusual operating conditions. Most incorporate the Carl Mayer recirculating heating system with sealed combustion chamber that keeps gases from prematurely escaping into the load area. Cores and molds are baked evenly with no burning. Temperatures are always under control.

Write for Bulletin 53-CM





TOP RIGHT—This large car type mold oven is installed at Pittsburgh Steel Foundry. Its special triple slotted panel construction reduces heat loss 1/3. Fuel savings up to 50% over old conventional methods are possible. Drying time is often cut in half and temperatures are uniformly controlled.

MIDDLE RIGHT—This rack type core baking oven is at the Fremont Foundry Co., Fremont, Ohio. It is equipped with a recirculating combination gas-oil fired heating system.

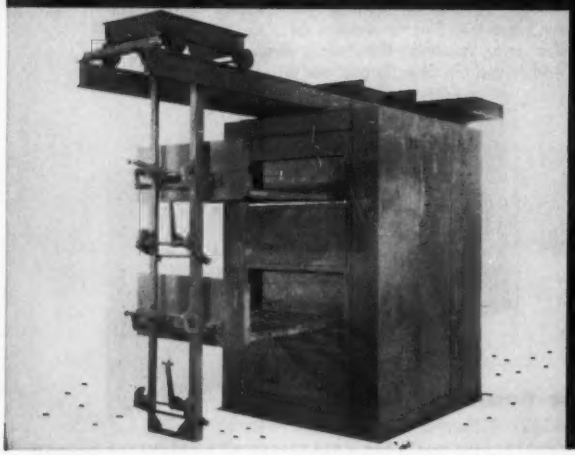
BOTTOM RIGHT—Vertical Core Oven (unloading position) at A. C. Williams Company, Ravenna, Ohio. This oven is 11'-0" wide x 11'-0" deep x 45'-0" high.

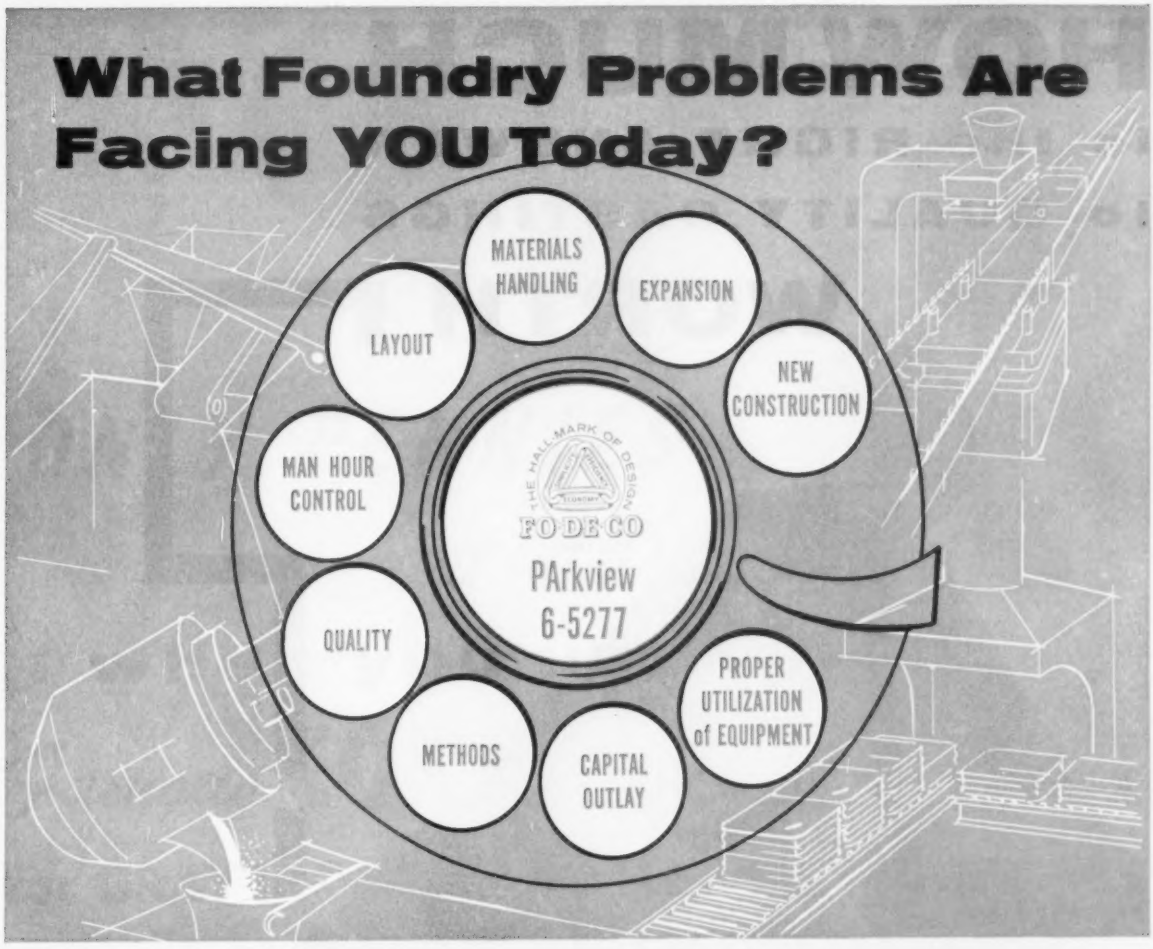
BELOW—Our standard rolling drawer type core baking oven. The heating equipment (not shown) may be mounted on floor beside unit or on the roof. Particularly adaptable to brass and aluminum foundries.

THE **carl mayer** CORP.

20800 CENTER RIDGE ROAD CLEVELAND 16, OHIO

OTHER PRODUCTS: Heat Treating Ovens and Furnaces • Rod Bakers • Welding Rod Ovens • Paint and Ceramic Drying Ovens • Special Processing Equipment and Accessories





THEIR *Answers* ARE AS CLOSE AS YOUR TELEPHONE!

By contacting FODECO (Foundry Design Co.), you may bring into your plant immediately a foundry engineering service developed by experienced personnel who can offer design ingenuity for special purposes adaptable to your operations.

At all times the objective is to achieve maximum efficiency and coordination in melting—molding—coremaking—cleaning. With such coordination, foundry deficiencies are remedied and production increased. Complete foundry production layouts utilizing existing equipment or guiding alterations, expansion or selection of new equipment are fundamental functions of our service.

Let us arrange for you to visit any of the companies who have availed themselves of our service.

FOUNDRIES SERVICED BY FODECO

AMERICAN FOUNDRY & MFG. CO.	St. Louis, Mo.
J. I. CASE CO.	Racine, Wisc.
J. I. CASE CO.	Rockford, Ill.
ELECTRIC STEEL FOUNDRY CO.	Portland, Oregon
ELYRIA FOUNDRY DIVISION OF CHROMALLOY CORP.	Elyria, O.
LUDLOW VALVE MANUFACTURING CO., INC.	Troy, N. Y.
MACK TRUCKS, INC. (Steel Foundry)	New Brunswick, N. J.
OTIS ELEVATOR CO.	Yonkers, N. Y.
A. P. SMITH MANUFACTURING CO.	East Orange, N. J.
TOWER GROVE FOUNDRY	St. Louis, Mo.
VIKING PUMP CO.	Cedar Falls, Iowa
WORTHINGTON CORPORATION	Harrison, N. J.
WORTHINGTON CORPORATION	Buffalo, N. Y.
WORTHINGTON CORPORATION	Oil City, Pa.
HONOLULU IRON WORKS CO.	Honolulu, T. H.
LAKEY FOUNDRY CORP.	Muskegon, Mich.

THE HALL-MARK OF DESIGN FODECO®

FOUNDRY DESIGN CO.

Affiliate: SORBO-MAT PROCESS ENGINEERS

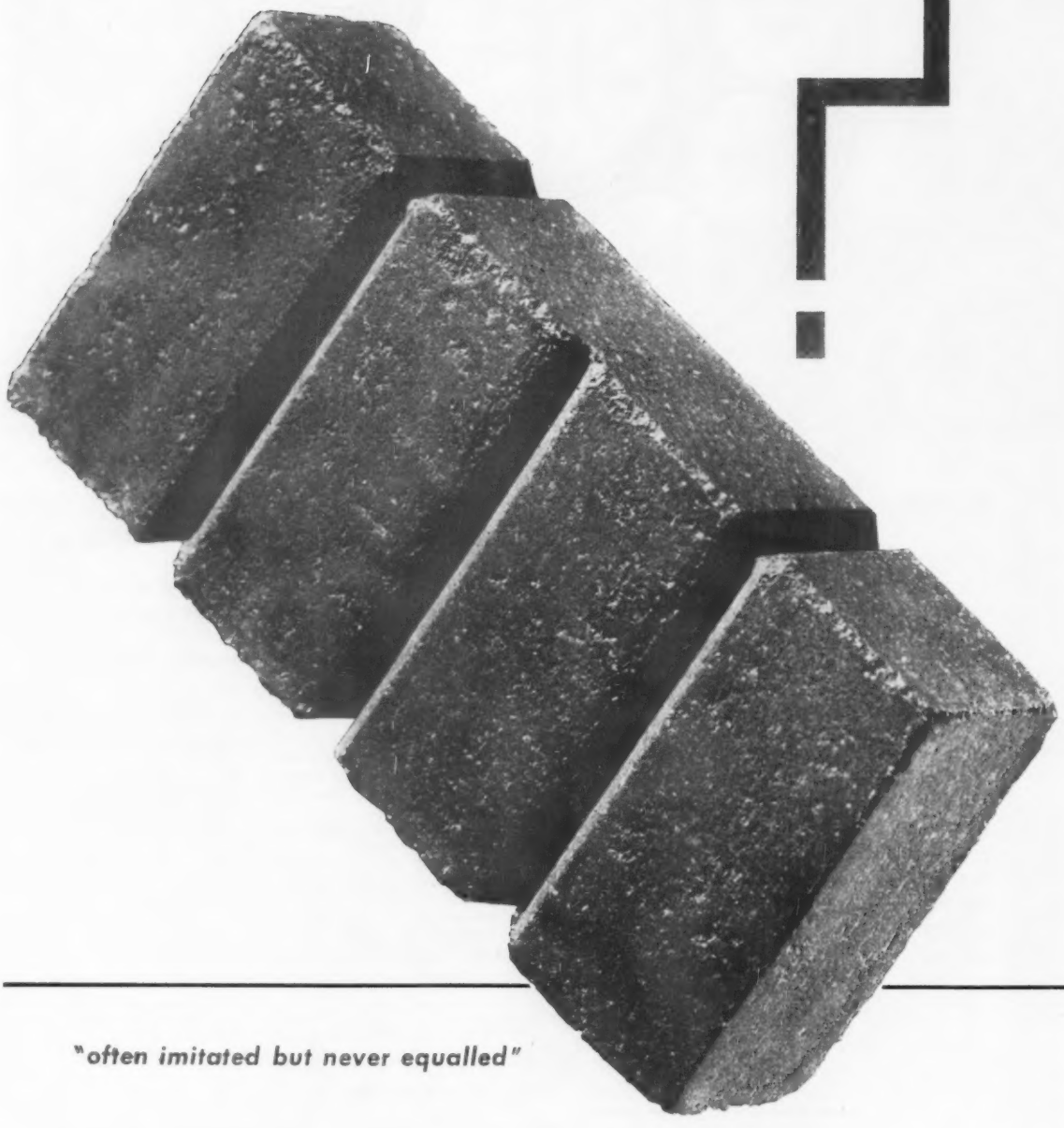
106 South Hanley Road • St. Louis 5, Missouri • Telephone PArkview 6-5277

Circle 590 on Page 53

HOW MUCH

is the RIGHT ANSWER to QUALITY CASTINGS

WORTH ?



"often imitated but never equalled"

ONLY PENNIES *a day*

when you use

Famous CORNELL CUPOLA FLUX

for GRAY IRON and MALLEABLE FOUNDRIES

Ask the men who operate the cupolas with Famous Cornell Flux! They'll tell you that Famous Cornell Flux always produces cleaner metal which reduces scrap losses, gives greater tensiles—increases fluidity of slag—guarantees complete cleansing of coke (giving carbon constant). Increased life of lining both in cupola and ladles alone will more than cover cost of Famous Cornell Cupola Flux. You'll save many hours of digging out time because drops are cleaner. Famous Cornell Flux is made in easy-to-handle brick form. Simply toss one brick into the cupola with each ton charge of iron. If you haven't enjoyed the benefits of Famous Cornell Flux, call a Cornell representative today.

The Benefits . . The Advantages of Famous CORNELL Aluminum, Copper or Brass Flux

Makes metal pure and clean.
Permits use of more scrap without danger of dirt, porous places or spongy spots, due to dirty metal.
Thinner, yet stronger sections can be poured.
Metal does not cling to the dross as readily.
Crucible or furnace linings are kept clean and preserved.
Cleanses molten brass (whether red or yellow) even when the dirtiest brass turnings are used.
Saves considerable tin and other metals.
Forms a perfect covering over the metal during melting, prevents oxidation and reduces obnoxious gases to a great extent.

Write for Bulletin 46-A.

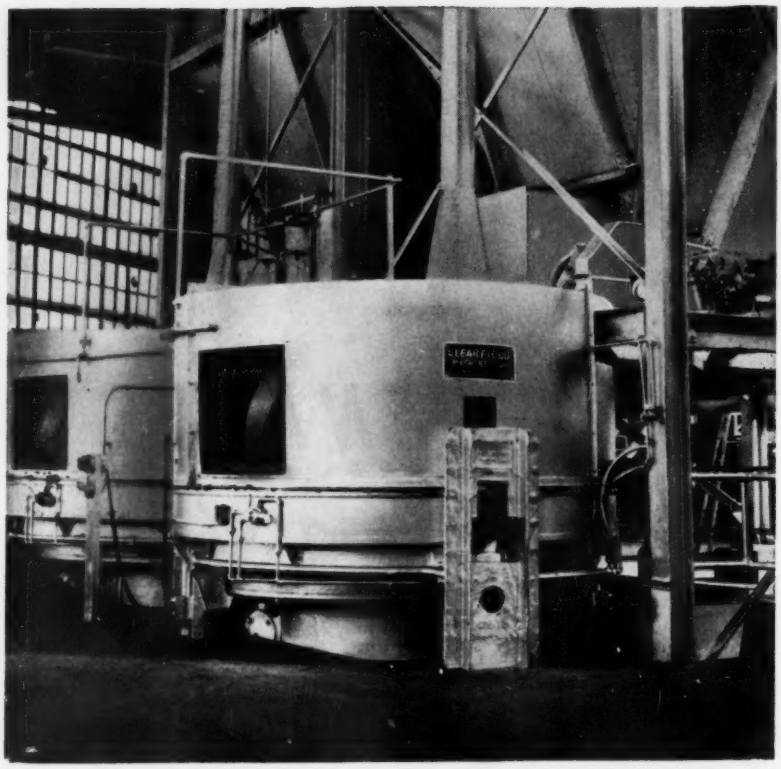
The CLEVELAND FLUX Company
1026-40 MAIN AVENUE, N. W. • CLEVELAND 13, OHIO
Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

FAMOUS CORNELL FLUXES
Trade Mark Registered

Circle 591 on Page 53

the

Clearfield Mixer



is

engineered, designed and built to *prepare sand properly*

Write today for Catalog No. 90. Get complete details on the tested efficiency of Clearfield Mixers.

Properly prepared sand for best foundry results doesn't just happen. It's the natural result of using correct equipment and a matter of precision in controlling all factors involved. Clearfield Mixers always give you properly prepared sand, and there is a Clearfield for every requirement.

***CLEARFIELD MIXER** mixes, tempers, aerates*

CLEARFIELD MACHINE COMPANY

Clearfield, Pennsylvania, U. S. A.

Circle 592 on Page 53

Use These Cards . . .

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- For more information on anything advertised in this issue
- For further data on products described in the Equipment and Supplies section (Page 121)
- To get copies of publications listed in the Literature for Foundrymen section (Page 169)
- To request extra copies of editorial articles

FOUNDRY — May 1959

401	421	441	461	481	501	521	541	561	581	601	621	641	661	681	701
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719	739	759	779	799	819	839	859	879	899	919	939	959	979	999	1019
720	740	760	780	800	820	840	860	880	900	920	940	960	980	1000	1020

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FOUNDRY — May 1959

401 421 441 461 481 501 521 541 561 581 601 621 641 661 681 701 721 741 761 781 801 821 841 861 881 901 921 941 961 981 1001
402 422 442 462 482 502 522 542 562 582 602 622 642 662 682 702 722 742 762 782 802 822 842 862 882 902 922 942 962 982 1002
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406 426 446 466 486 506 526 546 566 586 606 626 646 666 686 706 726 746 766 786 806 826 846 866 886 906 926 946 966 986 1006
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419 439 459 479 499 519 539 559 579 599 619 639 659 679 699 719 739 759 779 799 819 839 859 879 899 919 939 959 979 999 1019
420 440 460 480 500 520 540 560 580 600 620 640 660 680 700 720 740 760 780 800 820 840 860 880 900 920 940 960 980 1000 1020

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FOUNDRY

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Just mail one of these cards . . . for more information on anything advertised in this issue . . . for further data on products described in the Equipment and Supplies section (Page 121) . . . to get copies of publications listed in the Literature for Foundrymen section (Page 169) . . . to request extra copies of editorial articles

FIRST CLASS
Permit No. 36
CLEVELAND, OHIO

BUSINESS REPLY MAIL
No Postage Stamp Necessary If Mailed In the United States

—POSTAGE WILL BE PAID BY—

FOUNDRY
Penton Building
Cleveland 13, Ohio

Reader's Service Dept.

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Reader's Service Dept.

Rugged, lightweight Transite Core Plates add new speed to precision core production

Asbestos-cement composition resists shock, breakage, corrosion . . . is easily cleaned

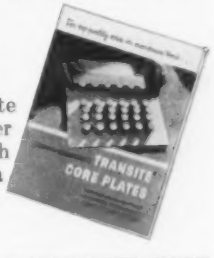
More and more experienced foundrymen rely on sturdy, finely sanded Transite® Core Plates for the smooth, level surface needed to turn out top-quality cores in minimum production time. The unusually light weight of the boards makes them easy to handle . . . also helps step up production.

How can Transite Core Plates stay smooth and true, even during baking and drying? They're fabricated of fibrous asbestos and cement in a special Johns-Manville process. Year in and year out, the rugged material stands up with a minimum of warpage and wear. Boards resist shock and corrosion, won't crack or break under normal conditions. Surfaces can be easily cleaned, too.

Transite Core Plates have proved themselves in hundreds of ferrous and non-ferrous foundries all over the country. If you haven't already done so, why not give them a chance to go to work, profitably, in your operation?

Get all the facts—send for FREE new Transite Core Plates folder

Whether or not you now use Transite Core Plates, get our FREE new folder IN-219A today! It contains a wealth of helpful information—can make a contribution to *your* profit picture. Send the coupon below.



JOHNS-MANVILLE JM PRODUCTS

Johns-Manville, Box 14, New York 16, N.Y.
(In Canada, Port Credit, Ontario)
Please send me booklet IN-219A at no cost or obligation to me.

Name_____ Position_____

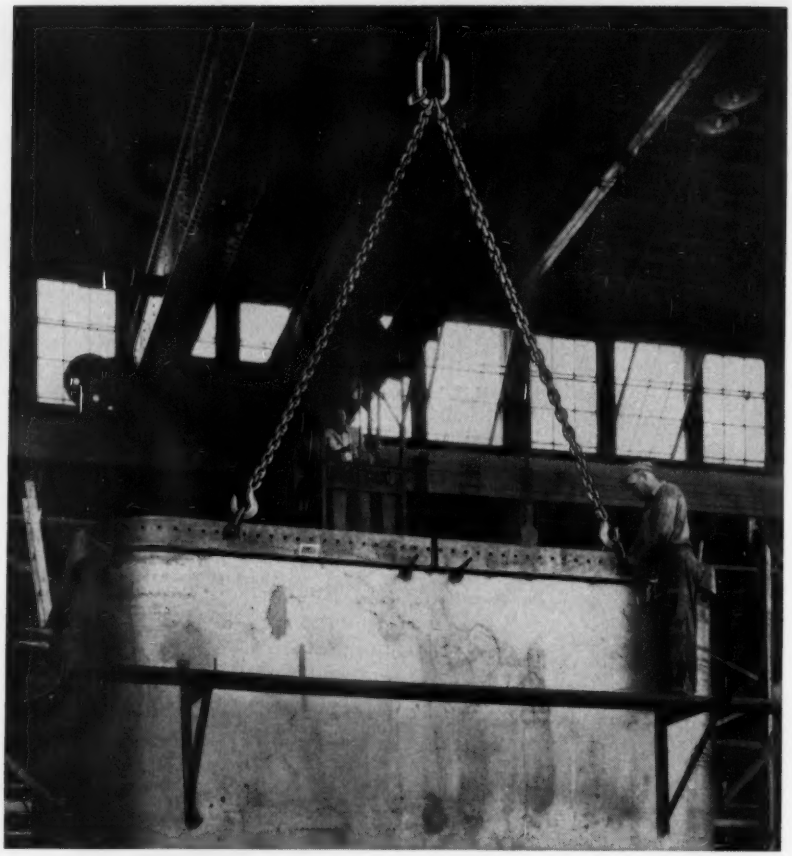
Firm_____

Address_____

City_____ Zone____ State_____

Circle 593 on Page 53

NOW... Get One-Day Service from our Authorized Distributor on



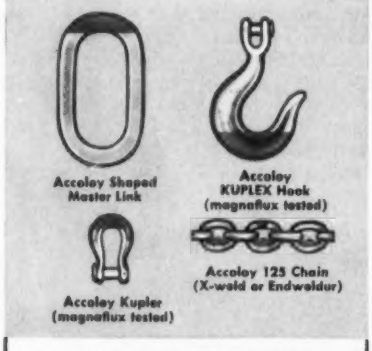
NEW ACCOLOY KUPLEX SLING CHAINS

• Imagine... you can now get ***one-day delivery service*** on ACCOLOY KUPLEX Chain Slings like you see here from our nearby Authorized KUPLEX distributor! This really remarkable development in speedy sling service is made possible by the new KUPLEX coast-to-coast system of localized service to meet your sling chain needs. No more waiting around for shipments from the factory . . . no more returning damaged slings to the factory for repairs. Our KUPLEX distributor is equipped to offer you both of these valuable services, and he's as near to you as your telephone.

KUPLEX is a modern sling chain that has been tried and proved through thousands of applications. Its streamlined form greatly reduces the chance of snagging on other objects. KUPLEX Sling Chains are assembled from genuine ACCOLOY KUPLEX component parts which have been factory proof-tested at twice their specified load limits. Each part is designed and manufactured specifically for use with all other parts of the complete KUPLEX sling assembly. These matched components are made to ACCO *Registered* Specifications from heat treated ACCOLOY steel, and are engineered to be as strong as the chain itself. Hooks and Kuplers are magnaflux-tested. In addition, you are assured of complete safety—with genuine component parts—by a **CERTIFICATE OF TEST** issued by ACCO and signed by the distributor with each complete sling purchase.

• • •

Write our York, Pa., office for the name of the Authorized Kuplex Sling Distributor nearest to you.


Accoloy Shaped Master Link
Accoloy KUPLEX Hook (magnaflux tested)
Accoloy Kupler (magnaflux tested)
Accoloy 125 Chain (X-weld or Endweldur)

SIX CHAIN SIZES WITH THESE FOUR COMPONENTS

• A nearby Authorized ACCOLOY KUPLEX Sling Distributor can furnish promptly from his stock the exact sling chains you need for your specific requirements; made up from the components shown above. Six chain sizes (¼" through ⅞") are available in single, 2-leg, 3-leg or 4-leg styles.

American Chain Division

AMERICAN CHAIN & CABLE

Bridgeport, Conn. • Factories: *York and *Braddock, Pa.

Sales Offices: *Atlanta, Boston, *Chicago, *Denver, Detroit, *Houston, *Los Angeles, New York, Philadelphia, Pittsburgh, ***Indicates Warehouse Stocks** *Portland, Ore., *San Francisco

ACCO

TRADE MARK

Circle 594 on Page 53

Foundry favorites for non-ferrous cutting-off

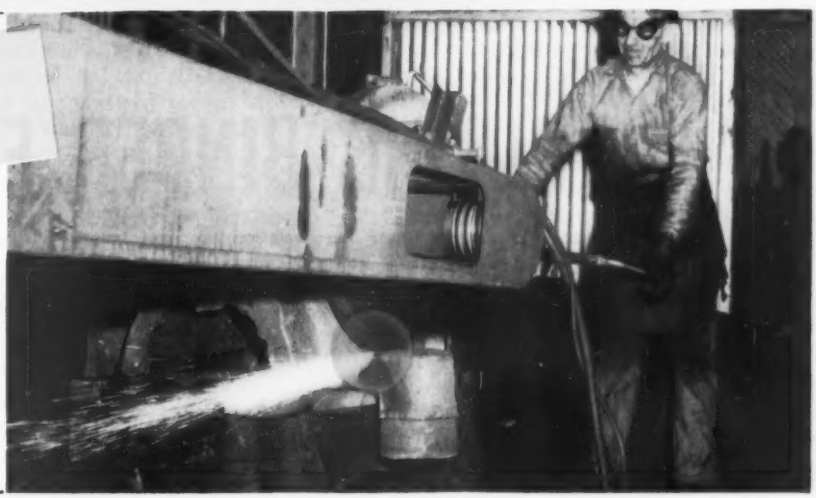
Norton BN and RN reinforced wheels bring you extra strength, safety and the cost-cutting "Touch of Gold"

BN . . . Time-Proved and Top-Ranking

Glass Cloth Reinforcement, Resinoid Bonded. Long popular for safety and durability, BN wheels are unequalled for cutting-off gates and risers on non-ferrous castings — also for nicking, slotting, deburring, and light snagging. This wide job range means you can use BN wheels on table type, swing frame, bench stand, pedestal or portable grinders. Where thinner wheels than the standard BN type are needed, such as on portable machines, the new type BNA wheel is recommended — available in thickness 1/16" and 3/32" up to 10" diameter.

RN . . . Newest Money-Saver

Glass Cloth Reinforcement, Rubber Bonded. Made with the strength, long life and safety built into the entire Norton reinforced wheel family, the RN is a new, faster and freer cutting, low-priced foundry economizer. It will pay you to investigate how the Norton RN is reducing costs in non-ferrous cutting-off.



W-1908

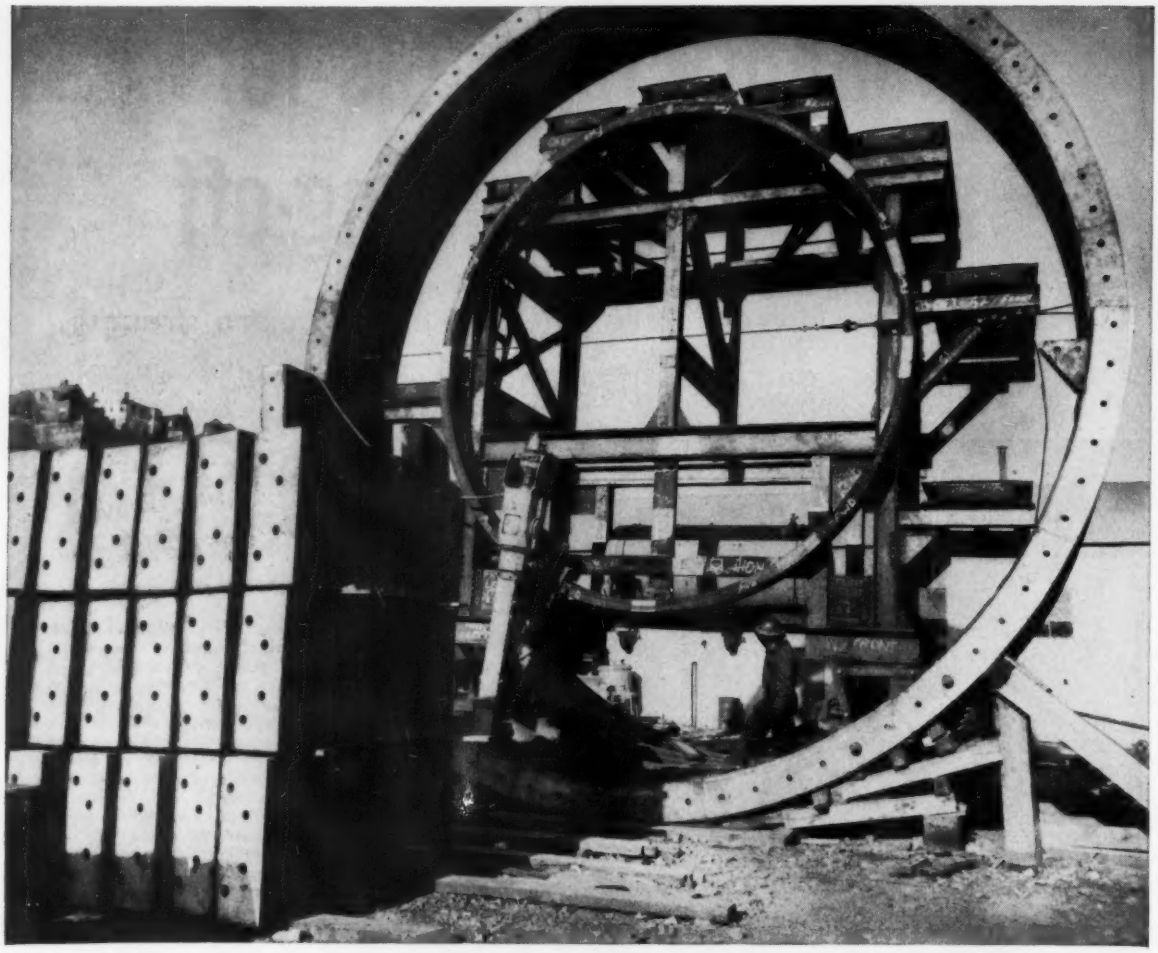
Your Norton Distributor will be glad to demonstrate BN, RN or other Norton wheels in your foundry — or to call in your Norton Abrasive Engineer for expert aid in solving any of your grinding problems. Get this prompt, worthwhile service — soon. NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

NORTON ABRASIVES

Making better products . . . to make your products better

NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — **BEHR-MANNING DIVISION** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

Circle 595 on Page 53



CASTINGS TO KEEP TRAFFIC MOVING SMOOTHLY—Giant castings, such as these used in highway tunnels, are another example of how the foundry industry contributes to progress.

TRULINE® BINDER ENDS FOUNDRY TRAFFIC JAMS

Foundries can't afford traffic jams. That's where Truline comes in—helping to keep castings moving on schedule and preventing oven bottlenecks.

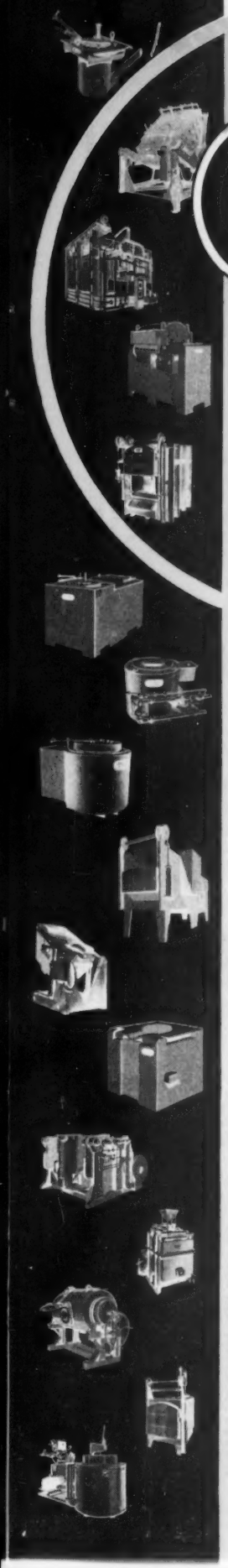
In the core room, in the oven, in the cleaning room, Truline Binder avoids delays every step of the way. For example, Truline's quick bake often makes it possible for one oven to do the work of two. Cores bonded with Truline collapse readily; are easily removed by hydroblast or knockout.

To learn more about how Truline can help keep your foundry on schedule, write for full information.

HERCULES

Naval Stores Department
HERCULES POWDER COMPANY
INCORPORATED
900 Market Street, Wilmington 99, Delaware

NF58-1



LINDBERG FISHER

This nameplate is on all the equipment anyone needs for melting and holding aluminum

Heat and aluminum have been Lindberg's babies for many years. If your product requires the application of heat to aluminum anywhere along the line, we can help you do the job. Lindberg-Fisher furnaces cover every requirement of "heat for aluminum" and embody the latest developments in the field. Many new design and engineering features make Lindberg-Fisher melting and holding furnaces, and accessories, the most modern equipment available to industry.

With Lindberg-Fisher furnaces too, you get the expert technical skills of Lindberg Engineering Company's staff of engineers, metallurgists, technicians, widely experienced in all phases of aluminum melting, casting and treating. Because Lindberg builds all kinds of melting equipment, gas—oil—electric (resistance, 60 cycle induction, arc, or high frequency) . . . we can intelligently and objectively recommend the proper type of furnace to suit your particular conditions and needs.

We can fit the latest melting and holding equipment into your production line efficiently and economically—helping you to manufacture your product to closer specifications, and at a lower cost. Consult your local Lindberg representative. You'll find him listed in the local classified telephone directories in major industrial areas.

Lindberg-Fisher Division, Lindberg Engineering Company, 2453 West Hubbard Street, Chicago 12, Illinois. Los Angeles plant, 11937 South Regentview Ave., at Downey, Calif. In Canada, EFCO-Lindberg, Ltd., Toronto.
Also factories in: Argentina, Australia, England, France, Germany, Italy, Japan, Scotland, South Africa, Spain and Switzerland.

On the following two pages we've illustrated and described the Lindberg-Fisher equipment that covers all your "heat for aluminum" needs. Will you please turn the page?

LINDBERG heat for industry

Circle 597 on Page 53

FROM THE VERY BEGINNING

Starting with alloyed ingot or molten metal delivery from the reduction cells, aluminum can be processed in a wide selection of furnaces.

In Melting and Holding Furnaces

As shown in the flow diagram molten aluminum is delivered to either large capacity fuel fired reverberatory furnaces, or tilting two chamber induction furnaces for storage at suitable temperature . . . or alloyed ingot is melted and stored in similar furnaces . . . to provide an adequate supply of molten aluminum for the casting station area furnaces.

In Casting Station Furnaces

Molten metal received from the large storage or breakdown furnace described above or from smaller melting furnaces—again either fuel fired or electric, is received at the casting area, maintained at the correct temperature and processed into desired castings. Most of the holding furnaces illustrated can also be used for melting.

Many of the casting station furnaces shown can be equipped with the Lindberg-Fisher Autoladle for automatic ladling or hand ladling.

Hot Metal Delivery

Ingot

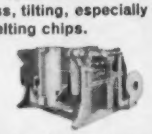
Fuel fired reverberatory, melting or holding. Charging well optional.

60 cycle two chamber induction, tilting; melting or holding.

Fuel fired, double reverberatory melting and holding. Especially suitable for alloying. Charging well optional.

60 cycle, two chamber induction, tilting; melting and holding.

60 cycle induction coreless, tilting, especially for melting chips.



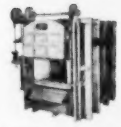
Fuel fired, crucible or pot, tilting, melting.

Electric resistance, "radiant muffle," Dry-Hearth, melting and holding, nitrogen atmosphere, especially for insert scrap.

High frequency induction, tilting, melting.

Autoladle for automatic ladling, four standard sizes available, up to 100 lbs.

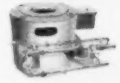
HYNI generator, low cost, high purity dry nitrogen.



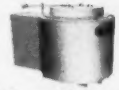
Fuel fired reverberatory, holding or melting.

Electric resistance, "radiant dome," reverberatory, holding.

60 cycle, two chamber induction, holding or melting, stationary.



Fuel fired crucible or pot, holding or melting, stationary.



Electric resistance, crucible or pot, holding or melting, stationary.

Fuel fired, Dry-Hearth, two chamber, holding and melting.

WHEREVER ALUMINUM NEEDS HEAT, LINDBERG-

A unique innovation is the Lindberg HYNI Generator... which supplies dry, high purity nitrogen economically, as a protective atmosphere for both melting and holding applications.

In Remelting Furnaces

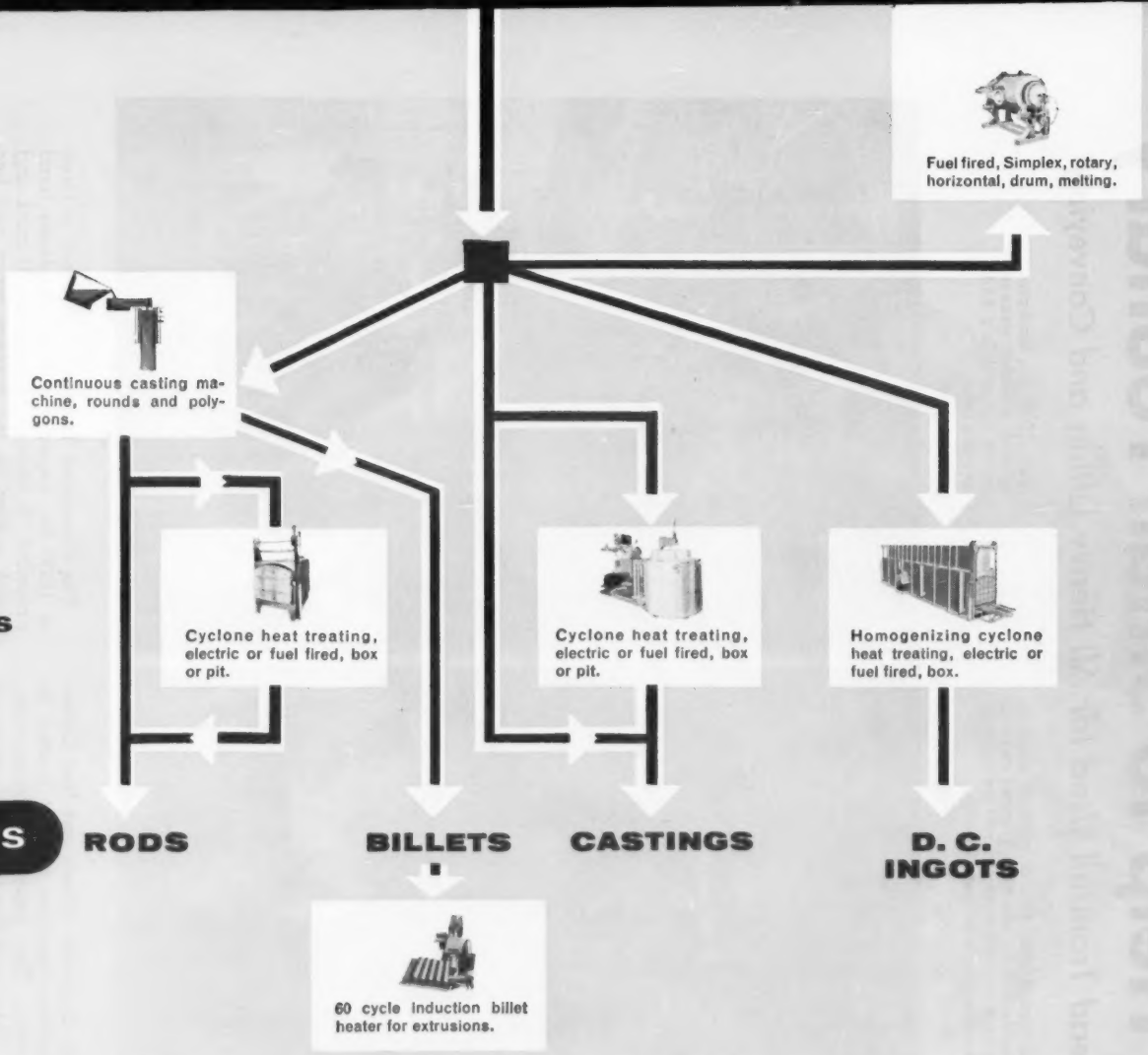
As the castings move out of the casting area for trimming, machining and finishing, the gates, risers, sprues, chips and scrap castings, etc., are returned to a remelt operation in one of the furnaces shown on the far right. These furnaces can be used for ingot meltings as well as for remelt operation.

In Heat Treating Furnaces

From the trimming and sorting station some castings are ready for direct use, others require suitable heat treatment as shown.

TO THE FINAL PRODUCTS

Lindberg can provide ANY furnace for your needs.


Fuel fired, Simplex, rotary, horizontal, drum, melting.
Continuous casting machine, rounds and polygons.
Cyclone heat treating, electric or fuel fired, box or pit.
Cyclone heat treating, electric or fuel fired, box or pit.
Homogenizing cyclone heat treating, electric or fuel fired, box.
RODS
BILLETS
CASTINGS
D. C. INGOTS
60 cycle induction billet heater for extrusions.

FISHER EQUIPMENT WILL APPLY IT MOST EFFICIENTLY

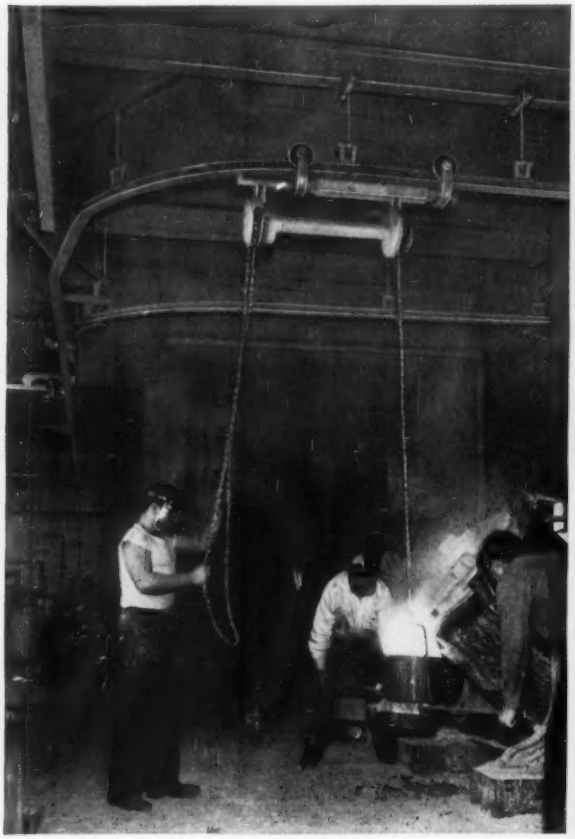
LINDBERG heat for industry

Circle 598 on Page 53

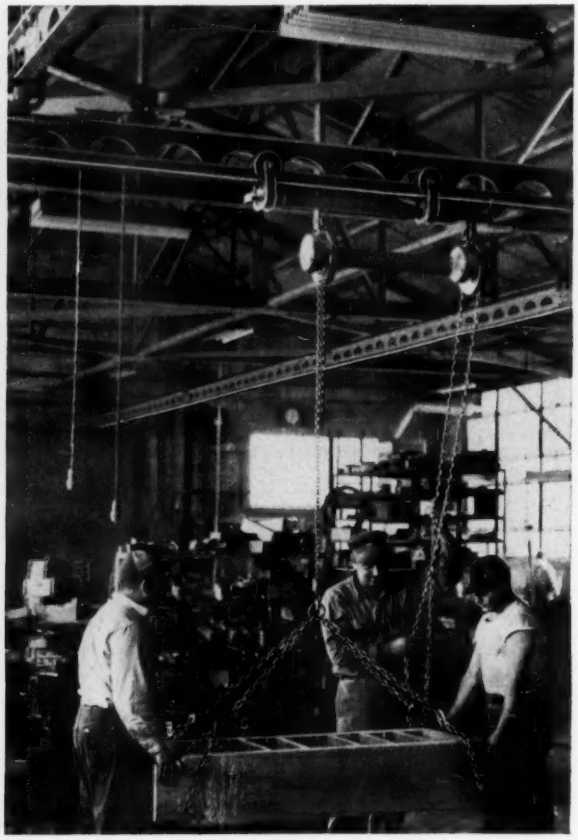
Big Help to Small Foundry

Overhead Tramrail Used for All Heavy Lifting and Conveying

Hot metal is delivered directly from furnaces to molds in shortest time possible with the overhead Tramrail carriers. The carrier seen here can be transferred onto the crane in other photo, thus eliminating in-between handling.



Two 1000 lb. hand-propelled transfer cranes serve the molding and pouring floor.



THE many important advantages that Cleveland Tramrail provides are not limited to large foundries. The Seagrave Corporation, Columbus, Ohio, well known manufacturer of fire-fighting equipment, has a small foundry which is profiting in several ways by a Cleveland Tramrail transfer crane and track system.

The Tramrail is a big aid to safety, does away with the danger of molten metal spilling on the workers' feet and reduces fatigue by removing lifting and carrying work. It saves the workers' backs and legs and enables them to leave at the end of a day nearly as fresh as when they came.

More metal can be poured in less time because 750-lb. crucibles are used now instead of 240-lb. crucibles formerly in the old foundry. With larger crucibles, fewer trips are required to the furnace room. This means less heat loss, faster pouring and better production

The Cleveland Tramrail equipment is rated at 1000 lbs. capacity and is completely hand propelled. It consists of a No. 2100 track and switch system in the furnace room and two transfer cranes over the molding and pouring floor. Metal is taken directly from furnaces to molds without rehandling.

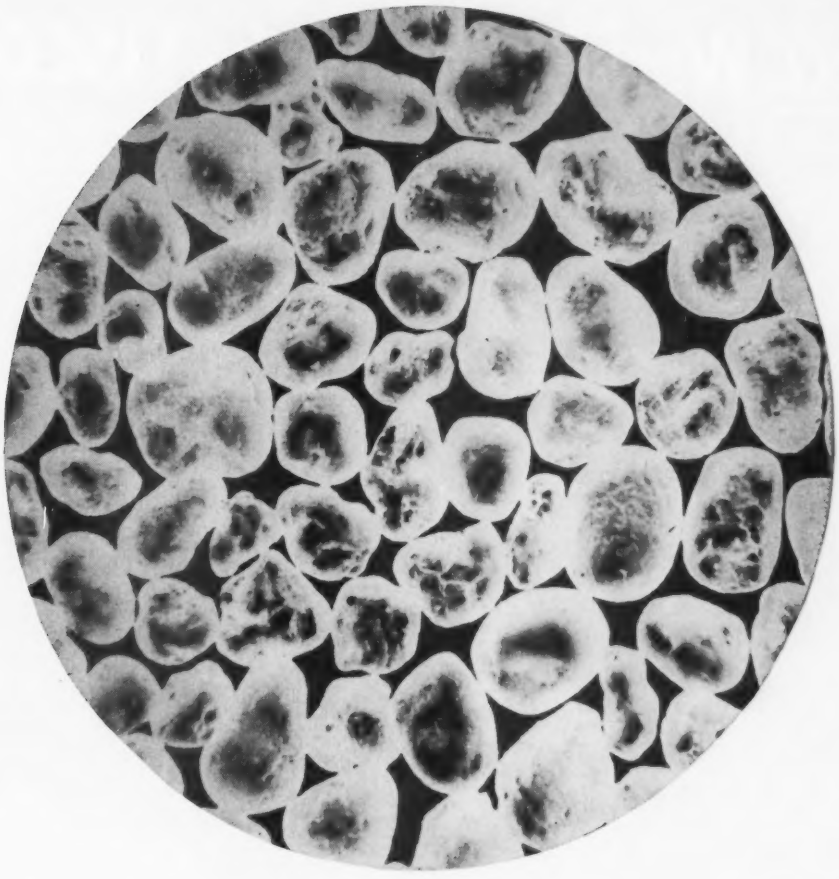
About 3000 lbs. of castings weighing from an ounce to 400 lbs. are produced in an 8-hour day. These are of various brass and bronze alloys for pumps, valves, impellers and suction pipes used on Seagrave fire-fighting apparatus. Only 10 men are employed for the entire foundry operation.

CLEVELAND TRAMRAIL

Overhead Materials Handling Equipment

Write for free booklet—2008.

CLEVELAND TRAMRAIL DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 3845 E. 286 St. • WICKLIFFE, OHIO



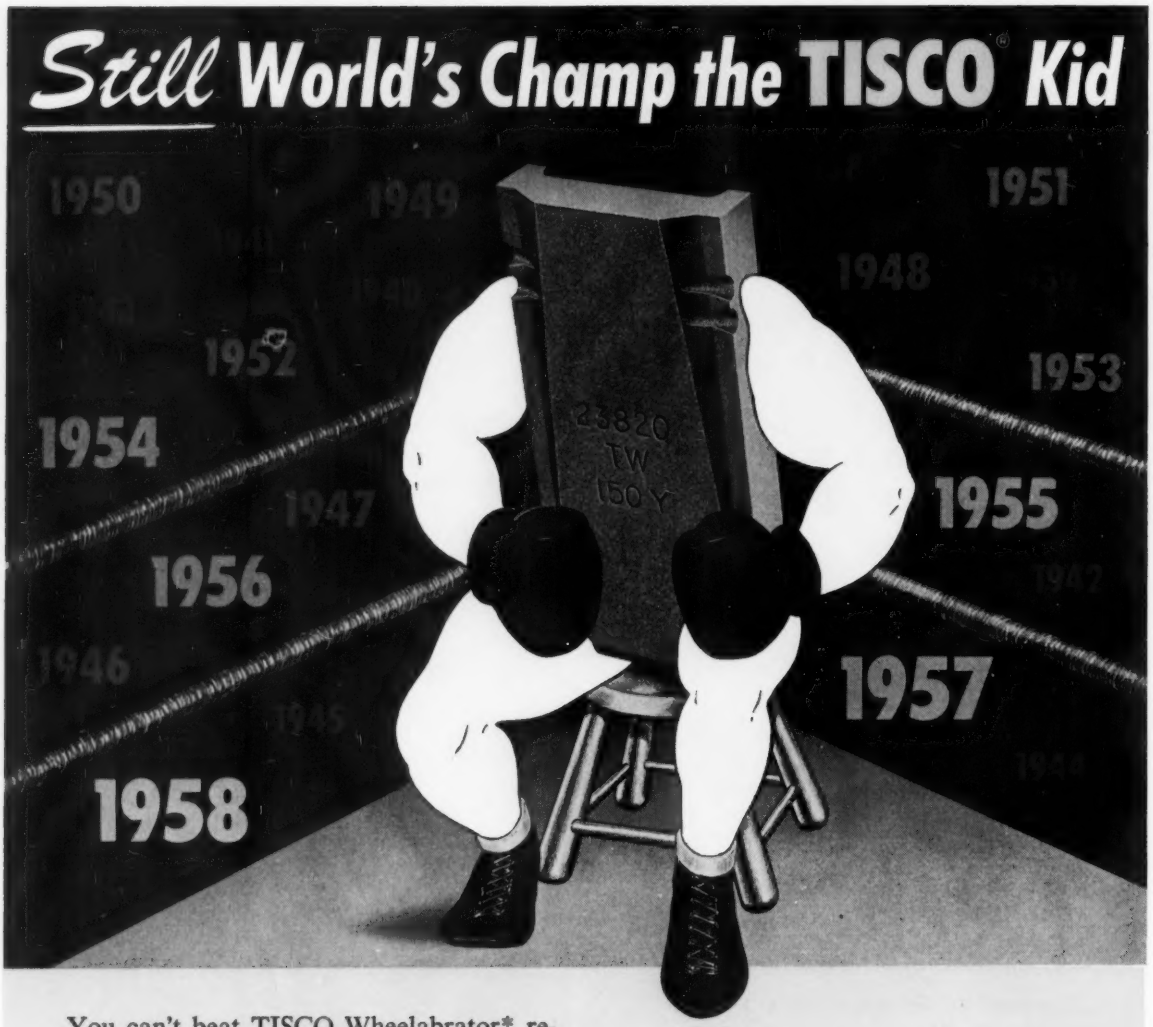
The sand in the microphoto above speaks quality. It's pure and fine, with the excellent rounded grain properties so desired for foundry use. This is indeed a superb sand —finest for foundries.

The obvious merits of quality can be yours with Wedron Silica

Send for illustrated brochure on Wedron sands.

Circle 600 on Page 53

Still World's Champ the TISCO® Kid



You can't beat TISCO Wheelabrator* replacement blades for long-wearing, trouble-free service. TISCO blades knock out wear and down-time with one profit-packing punch, because TISCO outlasts competitive blades *6 to 1*! Harder, thicker TISCO Wheelabrator blades are accurately ground for easy replacement, another cost-saving feature. Decide now to cut your costs — specify TISCO 150-Y High Chrome Alloy Wheelabrator replacement blades for extreme abrasion.

* Reg. U. S. Pat. off. by Wheelabrator Corp.

TISCO Replacement Blade — Manufacturers part numbers 36473 and 154069.

TISCO Replacement Blade — Manufacturers part numbers 47130 and 143600.

TAYLOR-WHARTON CO.

DIVISION OF HARSCO CORPORATION

Established 1742

HIGH BRIDGE 7, NEW JERSEY

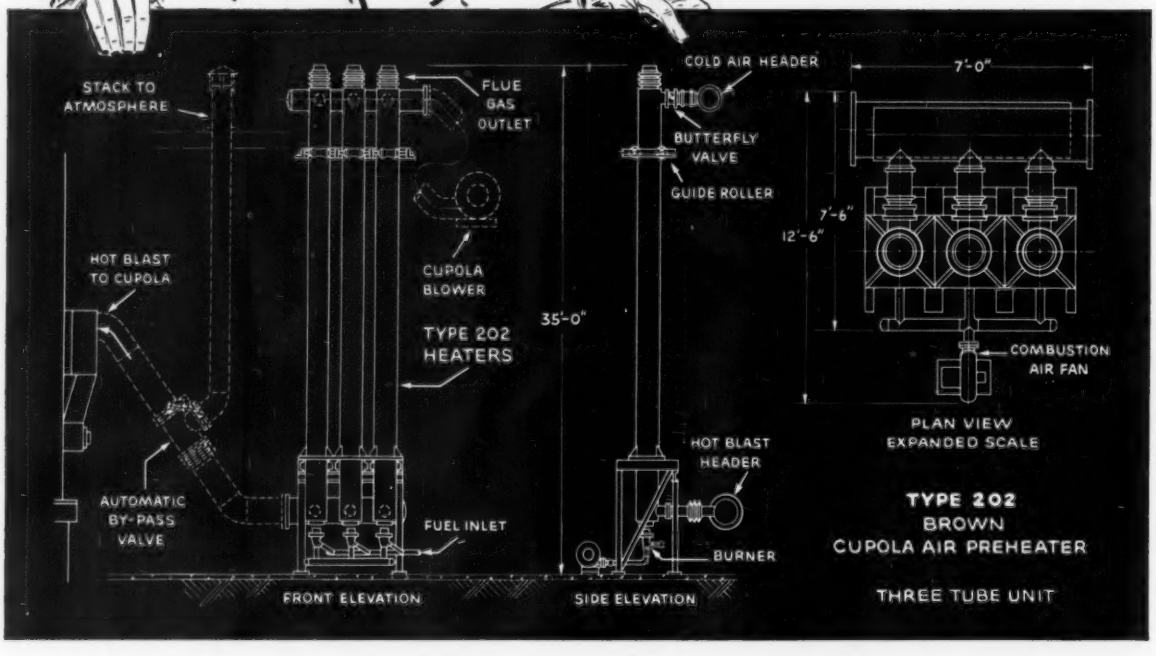
PLANTS: Cincinnati, O. — Birmingham, Ala. — Easton, Pa.

SALES OFFICES: New York — Chicago — San Francisco

Circle 607 on Page 53

ACCURATE MATCH PLATE CO.
1847 WEST CARROLL AVENUE
CHICAGO 12, ILLINOIS

HERE'S THE DIFFERENCE...



Brown Hot Blast Cupola Equipment is designed by *HEAT TRANSFER SPECIALISTS*

In many ways Brown Hot Blast Cupola equipment is the finest air preheater yet developed for foundry cupolas! The returns this system offers result from Brown's *exclusive specialization in designing and fabricating heat transfer equipment.* The entire engineering know-how and service of the single-purpose Brown organization has concentrated for 20 years on thermal equipment. Our energies are never diverted by the necessity of producing a wide range of equipment.

Brown hot blast air heaters give accurate temperature control within plus or minus 5° F, and easy and safe operation by any foundry employee from the remote control panel. Leakproof, modular independent units permit more accurate control, and eliminate the possibility of downtime. Take advantage of Brown's unequaled experience and specialization. Contact the Brown home office today.

HEAT EXCHANGE SURFACE
BROWN THERMAL PRODUCTS

For further information write for Foundry Cupola Survey Form

THE BROWN THERMAL PRODUCTS CORP.

Subsidiary of Brown Fintube Company

305 HURON STREET • ELYRIA, OHIO • Telephone: FAirfax 3-3291

SALES OFFICES AND REPRESENTATIVES: Chicago • Detroit • Houston • Los Angeles • New York • Oakland • Philadelphia • Pittsburgh

Circle 602 on Page 53

Now...at no increase in price

40% more HP...longer service life

with Gates Vulco Ropes

Gates brings you, through *Specialized* Research in V-Belts, another important cost-saving advance:

Now — at no increase in price — the horsepower rating of Gates Vulco Ropes has been increased 40%.

As replacements on standard drives, these V-Belts with 40% more load carrying ability will give longer service. Longer life reduces down-time, and cuts belt replacement costs.

And as the tag tells you: Belts labeled "Gates Vulco Rope" or "Gates Hi-Power" are identical in construction and can be used interchangeably in matched sets.

Available Now from your nearby Gates Distributor

Today, all Vulco Ropes in Gates distributor and warehouse stocks have the new higher horsepower rating.

See the Yellow Pages of your phone book for your nearest Gates V-Belt distributor.

Designing NEW Drives?

For new drives, Gates now offers you the *new Super HC V-Belts and Sheaves* — the most advanced concept in power transmission in 25 years. The Super HC Drive is far more compact . . . takes up to 50% less space. Costs less, too. You save as much as 20% over present V-Belt drives. Ask your nearby Gates distributor for Handbook DH-900 entitled, "The Modern Way to Design V-Belt Drives."

The Gates Rubber Company Denver, Colorado
Gates Rubber of Canada Ltd., Brantford, Ontario

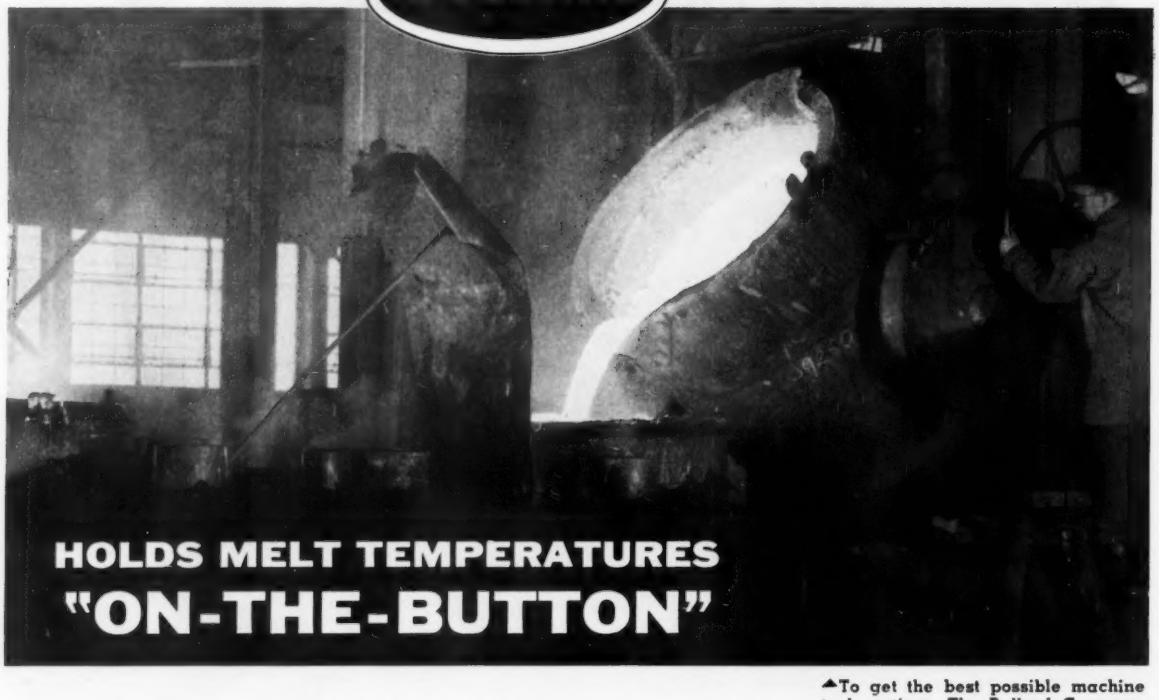
Gates
World's Largest Maker of V-Belts

TPA-412

Gates VULCO ROPE Hi-Power V-Belts

Circle 603 on Page 53

Ultra-modern BULLARD foundry



HOLDS MELT TEMPERATURES "ON-THE-BUTTON"

▲To get the best possible machine tool castings, The Bullard Company uses Foxboro Air Weight Control in their new 7-million dollar foundry. Ladle is pouring a 29,000-lb. casting.

...with Foxboro Air Weight Control

At the new multi-million-dollar Bullard Company foundry in Bridgeport, Conn., Foxboro Air Weight Controllers automatically help produce top quality castings for world-famous machine tools.

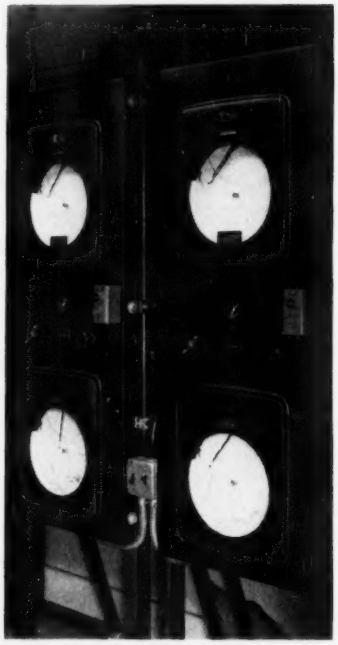
"We set them in the morning and forget them", says Stanley H. Bullard, foundry superintendent. "And they hold the set point all day — right on the button."

Foxboro Air Weight Controllers meter blast by *weight of air* instead of volume. They help cut fuel costs . . . practically eliminate pigging . . . provide accurate chart records of the melt. Variations in temperature, barometric pressure, cupola resistance, and line voltage are compensated automatically.

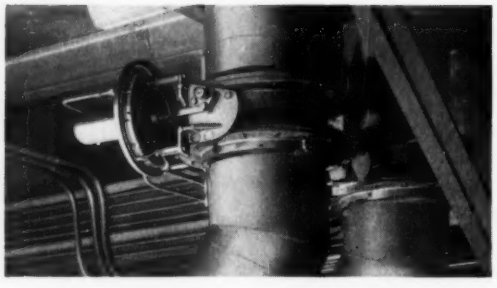
Foxboro Air Weight Controllers have been foundry-proved in over 1700 installations. See what they can do for you by writing for Bulletin 10-10, or by asking your nearby Foxboro Field Engineer. **The Foxboro Company, 325 Neponset Ave., Foxboro, Mass., U. S. A.**

FOXBORO AIR WEIGHT CONTROL

REG. U. S. PAT OFF.



▲The key to better castings at The Bullard Company is this control panel, serving two 12-ton per hour cupolas. Top instruments are Model 40 Air Weight Controllers. Below are continuous Windbox Pressure Recorders.



Foxboro Butterfly Valve installed in one of the 24-inch blast lines. Valve position is controlled by Foxboro Air Weight Controllers shown at right.

Circle 604 on Page 53

HINES chrome-plated PINS AND BUSHINGS

These extremely accurate, uniform pins and bushings, plus their micrometer controlled installation on HINES flasks, provide long, uninterrupted production and fast, smooth pattern draw.

One of many **HINES** *developments contributing to better foundry production*

HINES pins are hard-chrome-plated and ground — bushings are case-hardened, hard-chrome-plated and ground.

Tolerances are extremely close, yet there is but little friction between pin and bushing. They draw without chattering, without sticking and without requiring lubrication.

HINES pins and bushings will not rust — flasks are ready for use no matter how long they've been stored.

HINES flasks are machined for pins and bushings in a micrometer-adjusted jig, to guarantee perfect alignment of cope and drag.

Flasks can be equipped to your exact requirements — single or double pins, round, hex or "V" type — with adjustable slides or bushings.

HINES designed and manufactured the *first* hard-chrome-plated and ground pins and bushings over 30 years ago and has been producing them ever since. Hundreds of thousands sold during that time are still giving good service.

WRITE FOR CATALOG FOLDER NO. 211

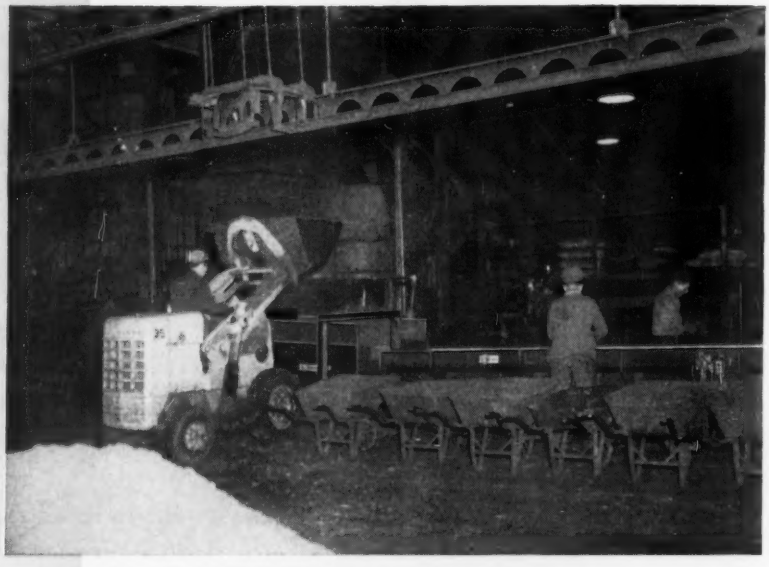
THE HINES FLASK CO.
3431 WEST 140th STREET • CLEVELAND 11, OHIO

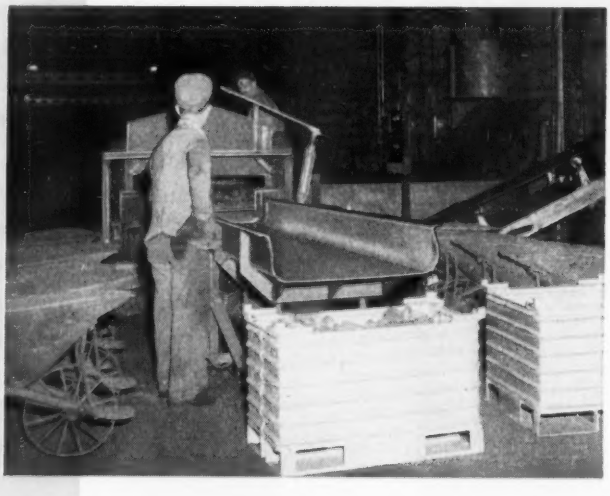
HINES FLASKS

Circle 605 on Page 53

OHIO STOVE COMPANY FOUNDRY holds production costs down with SIMPLICITY equipment

At Portsmouth, Ohio, in the modern foundry of the Ohio Stove Co., the SIMPLICITY 4′ x 6′ shakeout and the 30″ x 17′ model VS-12 conveyor (shown here at work) are helping speed operations and reduce unit production costs. First, snap molds are floor dumped; then both castings and sand are scooped and loaded onto the SIMPLICITY shakeout. The castings are then carried on the SIMPLICITY conveyor to the waiting tote boxes. The many plants that are using SIMPLICITY shakeouts are indicative of their foundry-proved superiority. Get complete facts on SIMPLICITY shakeouts, feeders, and conveyors. Write us today.





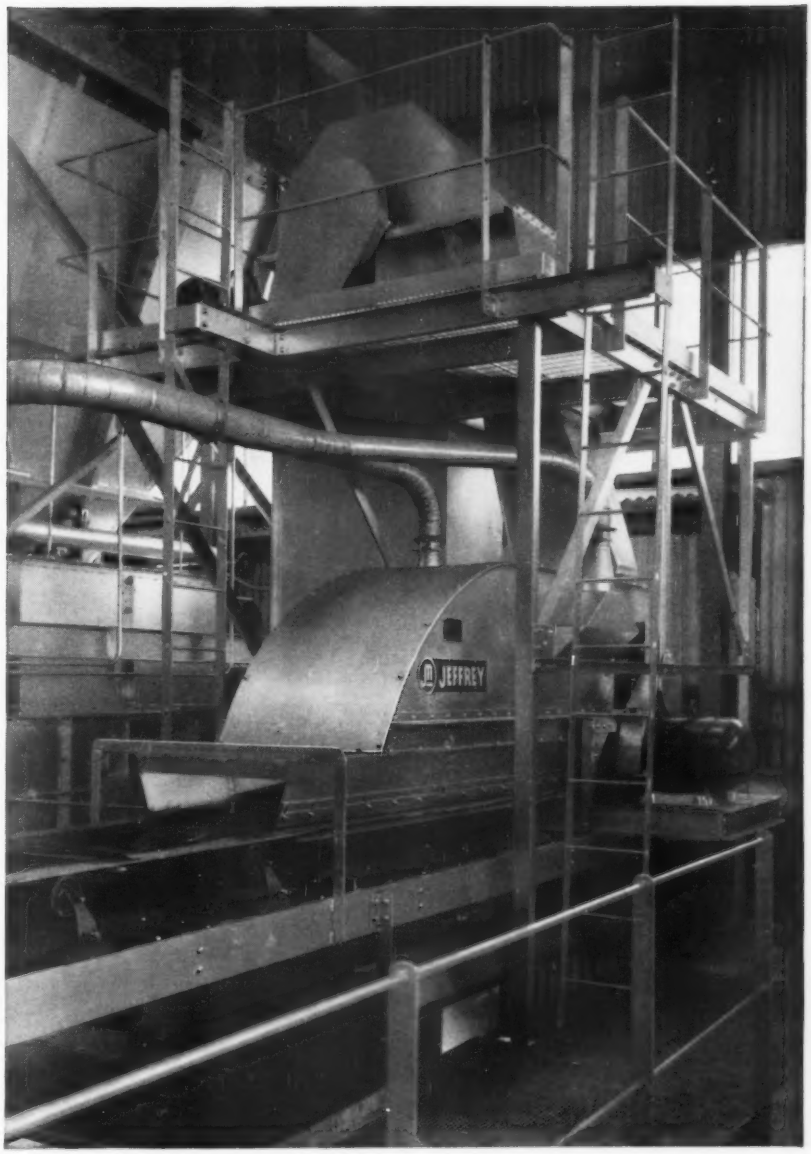
SALES REPRESENTATIVES IN ALL PARTS OF THE U.S.A.
FOR CANADA: Simplicity Materials Handling Limited, Guelph, Ontario
FOR EXPORT: Brown and Sites, 50 Church Street, New York 7, N. Y.

190

Simplicity
TRADE MARK REGISTERED
ENGINEERING COMPANY • DURAND 7, MICHIGAN

Circle 606 on Page 53

Treated sand is delivered onto a conveyor here for distribution to the molders' stations.



For most efficient sand preparation, add a **JEFFREY Aerator-Blender**

IT AERATES, cools, blends and fluffs up the sand—gives extra care in sand preparation which means a lot to your molders. Sand that has gone through the Jeffrey Aerator-Blender is more uniform, contributing to higher quality workmanship.

In operation, sand from the muller, or in certain cases directly after screening and temper addition, is fed against the rapidly revolving rotor. The hardened steel mingler bars mix and blend the sand, throwing it forward through the air inside the hood for cooling and aeration.

The Jeffrey Aerator-Blender is highly efficient, reasonable in first cost and free from the excessive wear and maintenance which often characterizes machines of this nature. Jeffrey foundry engineers will assist you in choosing equipment to suit your requirements.

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JEFFREY

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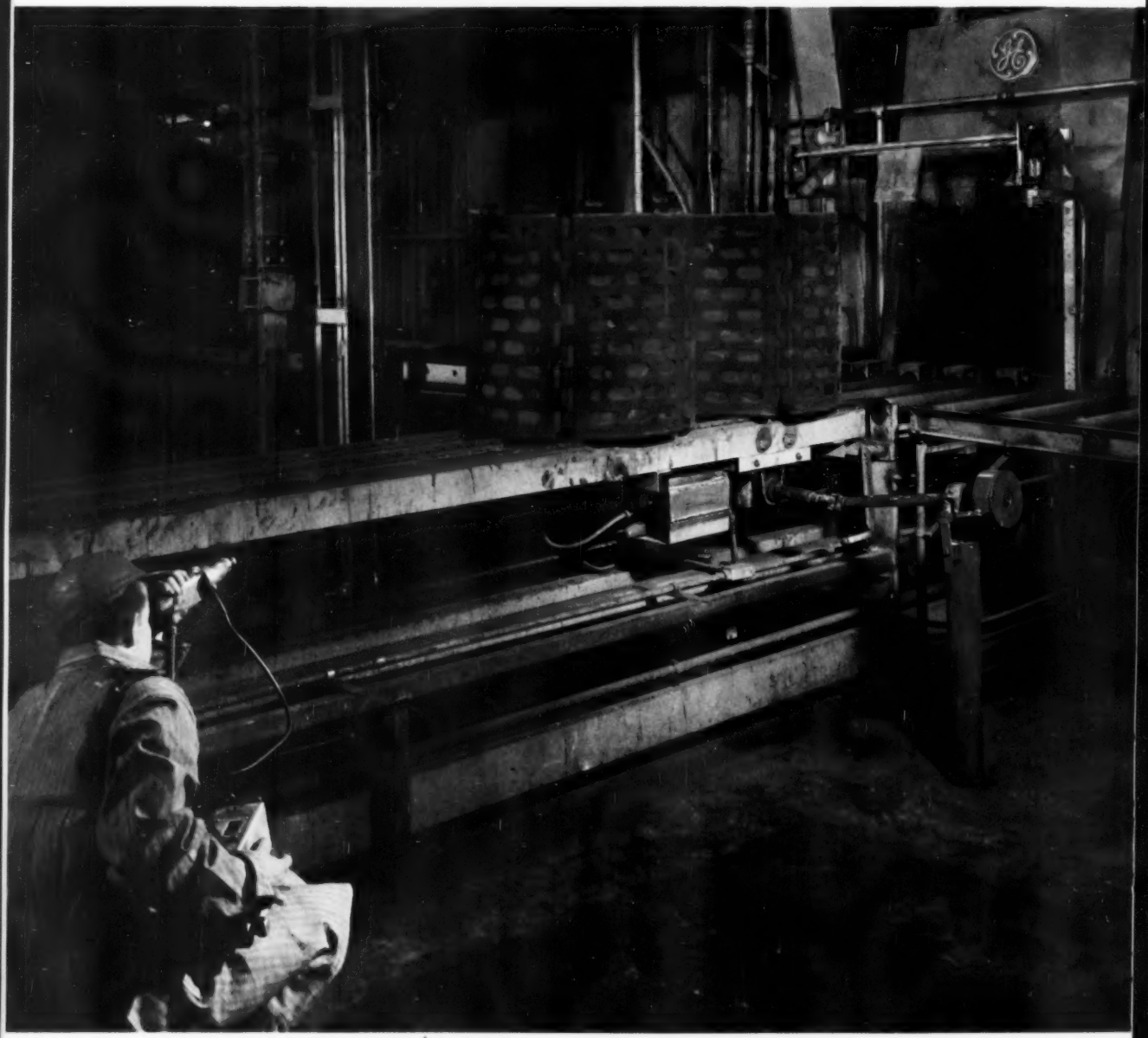
Circle 735 on Page 53

From General Electric . . .

HEAT



Castings automatically transferring from high temperature furnace to other pearlitic annealing equipment at Marion Malleable Iron Works, Marion, Indiana.

GENERAL ELECTRIC

ONE FURNACE SYSTEM DOES SEVEN JOBS

General Electric "systems" design combines furnace, temperature and atmosphere controls, and materials handling to cut annealing cycle 75%, provide added flexibility, and lower processing costs

When you bring your heat processing problems to General Electric, our engineers will give you what you want and need. Whether it's gas or electric, a small batch furnace or a complex, automated system, you need go no further.

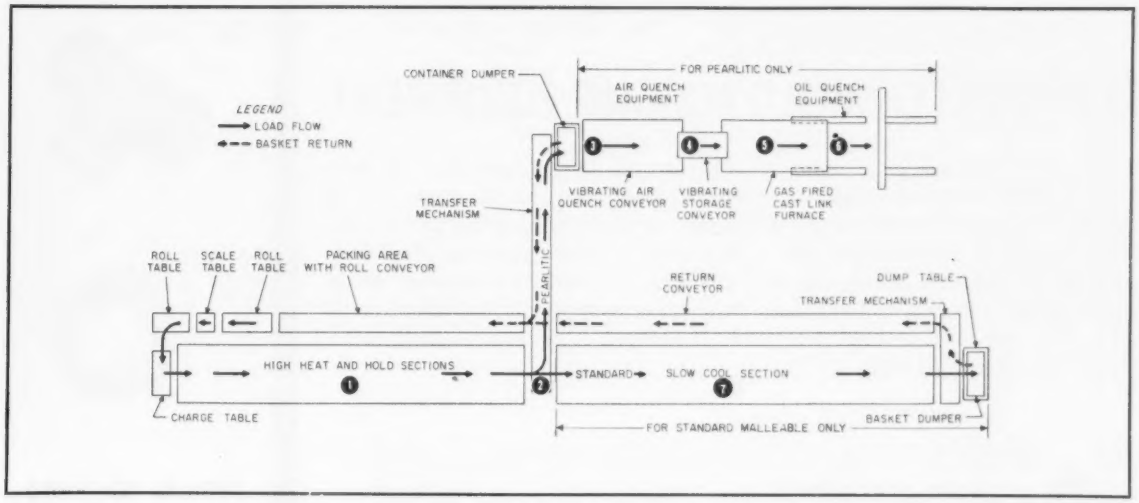
For example, when the **Marion Malleable Iron Works of Marion, Indiana,** set out to acquire "the most modern heat treating equipment which would be very flexible and produce highest quality at a nominal cost," they chose General Electric. The result: a complete system (at left and below) with integrated temperature and atmosphere controls and automatic handling equipment. With one packer and one operator, this system produces 1000 tons of standard malleable iron per month. Or 800 tons of pearlitic and 200 tons of standard malleable per month. Or, with the addition of a separate high temperature furnace, 1000 tons of standard malleable and 800 tons of pearlitic malleable per month. And depending on the type of material required, each of the seven automatic functions (below) can be varied as desired.

In addition, the automatically-controlled annealing cycle has been cut from five days to just 40 hours—a 75% speed-up! Quality is up, and controlled atmosphere (Neutralene) has practically eliminated surface decarburization and assures maximum alloy life of furnace components. Fuel costs are less because of shorter cycles, and labor costs are down. Flexible enough to produce either ferritic or pearlitic malleable, the furnace can even be left loaded and unattended over weekends to allow five-day operation.

As a result, Marion Malleable can offer a higher quality product and rapid delivery to its customers, and thanks to the savings of the G-E system, at a very nominal cost.

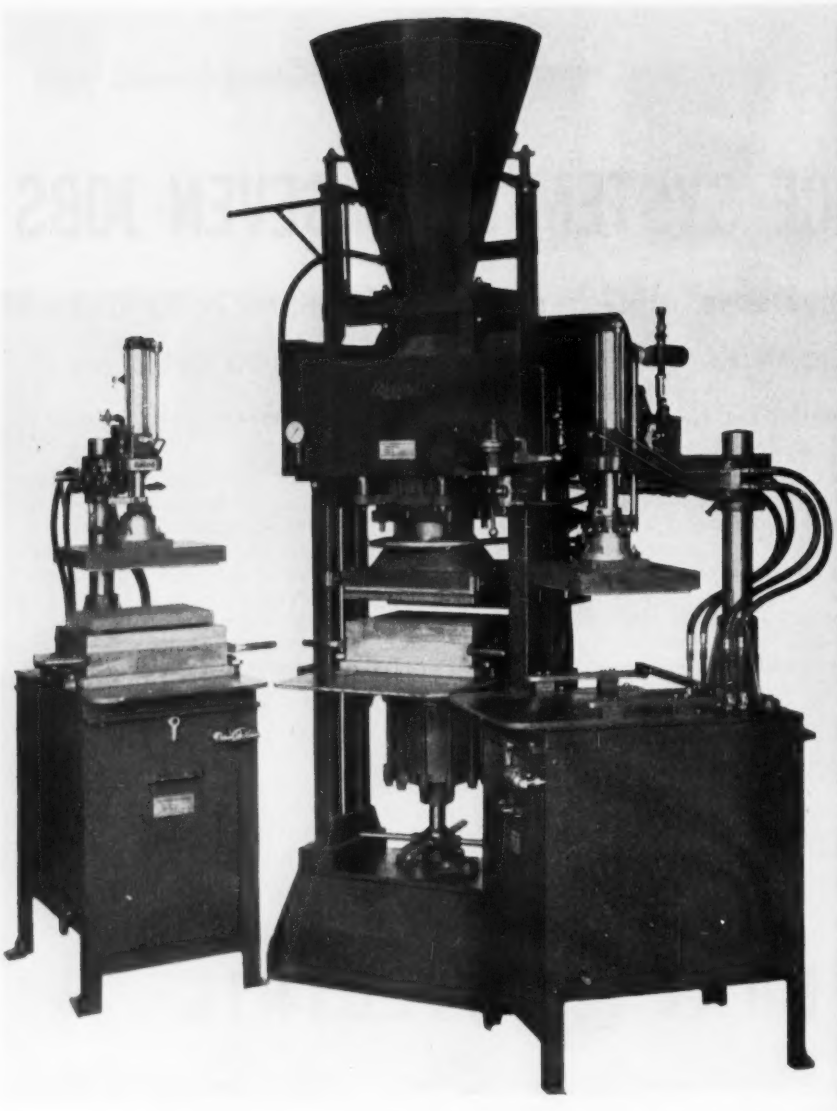
If you're planning a new heat processing installation or modernization—gas or electric, large or small, with or without atmosphere and materials handling equipment—it will pay you to contact your General Electric Apparatus Sales Office. General Electric Co., Section 721-26, Schenectady 5, N. Y.

GENERAL ELECTRIC



ONE SYSTEM, SEVEN JOBS. This complete heat processing system, designed and built by General Electric, automatically (1) heats and holds at temperature, (2) transfers and dumps, (3) air quenches, (4) reloads, (5) reheats, (6) oil quenches, or (7) slow-cools 1000 tons of castings per month with maximum flexibility. Note that two heat processes—pearlitic and standard malleable—can take place simultaneously, depending on mixture of material being processed, and yet work baskets are handled automatically from the time they are placed on the entrance table until the entire cycle is completed.

Circle 608 on Page 53



REDFORD CO_2 MOLD MAKING EQUIPMENT

Here is a proven way of applying the CO_2 process to the production of small castings. With the above Redford #420-D Core Blower and (2) Model H-2-M Gassing Stations, one mold is being blown and squeezed while another one is automatically gassed and stripped. Up to 80 complete molds (cope and drag) are produced in one hour. Molds are flat and can be stacked for pouring. Metal yield is greatly increased. Very little floor space is required. Millions of small parts have been cast to close tolerances at reduced costs. For complete information write for BULLETIN No. 421.

TYPICAL CO_2 MOLD CASTINGS

½ Actual Size

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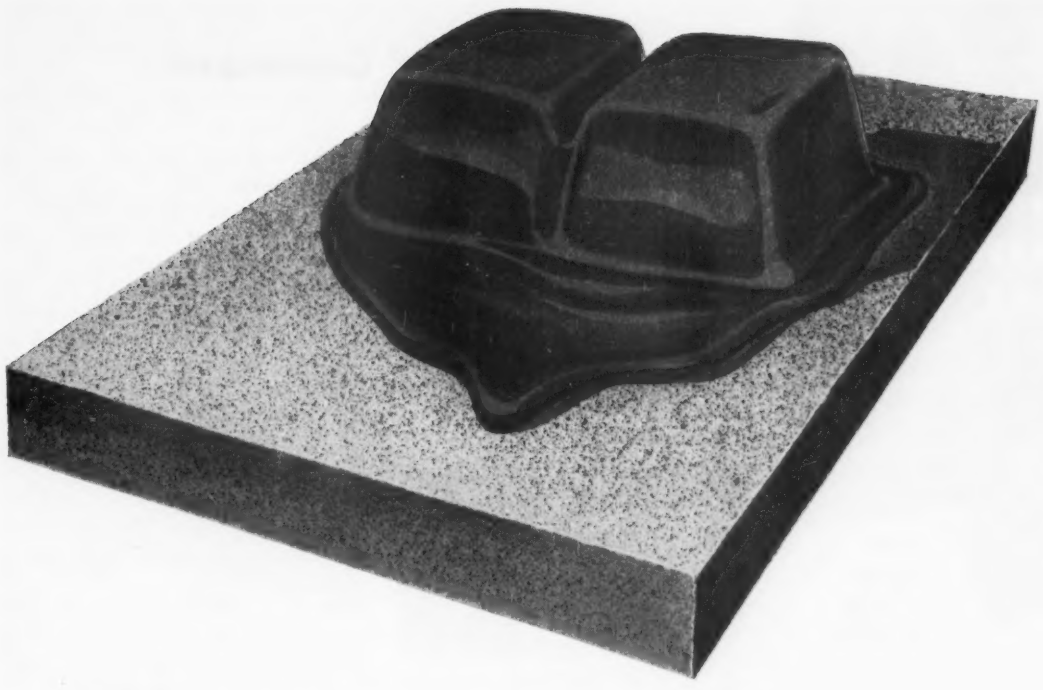
Phone: KEnwood 1-8611



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...CRYSTOLON* Silicon Carbide

Impact on a charging hearth . . . a surge of molten metal into a trough . . . attack by corrosive alloys, fluxes and slags . . . Norton CRYSTOLON Refractories stand up to *all* these rigors of aluminum melting and transfer operations. Their exceptional stamina and stability not only protect purity throughout critical processing but also sharply reduce refractory maintenance.

Small wonder. CRYSTOLON Refractories are the most resistant to corrosion and erosion of all known refractories — and they offer outstanding mechanical strength and the highest resistance to thermal shock.

Ideal for use at all key melting, holding and transfer points, CRYSTOLON Refractories are specifically recommended for reverberatory and induction type furnaces. On the melting hearth, in the hot wall, in the holding hearth, and in many other critical areas, they assure longer refractory life . . . cleaner metal, free from refractory inclusions. What's more, CRYSTOLON Refractories are not wet under these corrosive conditions. Refractory surfaces stay clean longer . . . last longer.

Use these versatile refractories wherever aluminum could cause costly trouble . . . wherever contamination is a threat: in melting areas, launders, spouts and simple valves . . . for tap blocks and stopper rods. Take full advantage of today's high purity pig . . . *protect* purity during *your* operations. Reduce your reject losses with Norton CRYSTOLON Refractories. Several types are available to meet your precise requirements: oxide-bonded CRYSTOLON "G"; nitride-bonded CRYSTOLON "N" and recrystallized CRYSTOLON "R" Silicon Carbide. For complete details, write NORTON COMPANY, Refractories Division 305 New Bond Street, Worcester 6, Mass.

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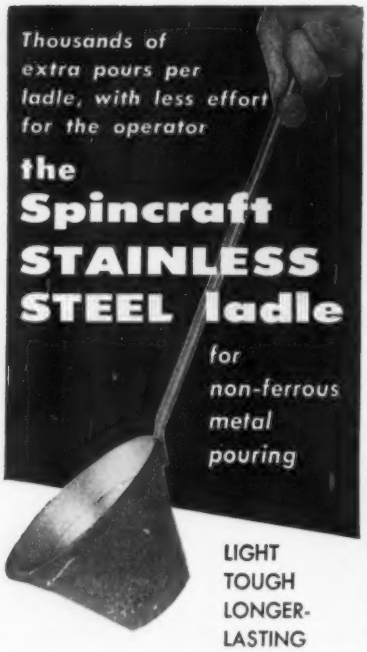
Engineered... Rx ...Prescribed

Making better products . . . to make your products better


Thousands of extra pours per ladle, with less effort for the operator
the Spincraft STAINLESS STEEL ladle
for non-ferrous metal pouring
LIGHT
TOUGH
LONGER-LASTING

If you pour non-ferrous alloys, Spincraft ladles will save you replacement costs and make the job much easier. Designed to reduce operator fatigue by their lightness, balance, and non-spill shape, they resist burning-through as only stainless steel with its high critical melting point can do. Spincraft ladles come in 23 sizes, from ¼ lb. to 30 lb. molten metal capacity.

- 75% lighter than cast iron ladles
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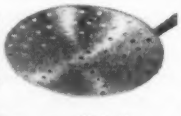
- Shot-blasted for coating adhesion
- Deep conical form makes pouring easier, minimizes spillage
- Can be used for zinc and other metals without coating
- "Whack proof" handle arc-welded to reinforced cup edge
- Built to last longer, work lighter. Let your operator use one, then try to take it away from him!

Complete handle on ¼ lb. through 9 lb. size; 10 through 30 lb. size has handle bracket stub to which proper length handle can be attached.

Also...Spincraft STAINLESS STEEL Skimmer

A skimmer that really skims! Shallow radius skims surface impurities instead of ladling as deeper-cupped skimmers do. Correct size holes prevent clogging. Short handle stubs fit common pipe and permit attachment of length and type handle you want.



IN FOUR DIAMETERS: 6 inch, 8 inch, 10 inch, 12 inch.

Spincraft ladles and skimmers are also available in low-cost mild steel.

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Send us complete information on:

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☐ Ladles	☐ Ladles
☐ Skimmers	☐ Skimmers

Company .....

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City ..... State .....

Name .....

Circle 611 on Page 53

Readers' Comment

Unusual Jamaican Foundry

To The Editors:

I am enclosing a Polaroid shot of one of the most unusual foundries I have ever been in. The Temple Foundry is situated in Montego Bay, Jamaica, British West Indies. The photograph shows the staff, headed by an ex-sailor Mr. Lewis G. Tole.

Bronze (brass) and aluminum

are the only metals cast. Most of the castings are captive—used for drawer pulls, doorstops, ornamental railings, etc., for the native furniture constructed and sold by the Temple Galleries.

The foundry exists only through technical knowledge gleaned from publications such as yours since none of the personnel are foundrymen. When I was there, they were melting plumbing fixtures for metal and (without temperature control) pouring pineapple-shaped doorstops into a "river sand" bonded with white flour and enough clay so that it could be rammed.

O. Jay Myers
Vice President

Reichhold Chemicals Inc.
525 N. Broadway
White Plains, N. Y.

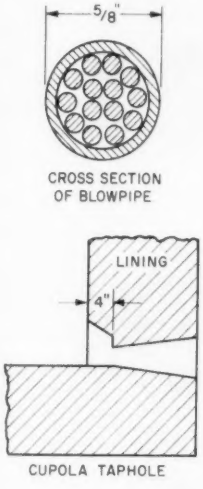
Opening the Tap Hole

To The Editors:

In the December issue, page 116, a description was presented of an emergency device for opening cupola tap holes. The idea works well and we have used it from time to time during the past 20 years, but as it was shown it often will not work. A clogged tap hole usually will not burn by simply blowing oxygen on it because the ignition temperature of the iron is too high.

You will get good results with a blow-pipe ⅝ in. diam filled with ⅛-in.-diam soft iron wire rods and the following procedure: Place some cotton waste impregnated with kerosene or oil near the taphole and cover it with some pieces of charcoal. Ignite the waste, place the end of the blowpipe on the burning materials, and blow with oxygen at very low pressure. The moment the iron ignites, as indicated by sparkling, the pressure of oxygen is increased, and the burning pipe is advanced to the frozen tap hole. In a few seconds molten iron will reappear at the spout.

Still better practice is to make sure that the top hole will not get clogged. It should be tapered outside and inside as shown in the accompanying illustration. The smallest diameter is about 4 in. from the inside face of the lining. For closing the first tap, use a very small lump of clay. In the following taps it will be necessary to use larger lumps, but always keep them as



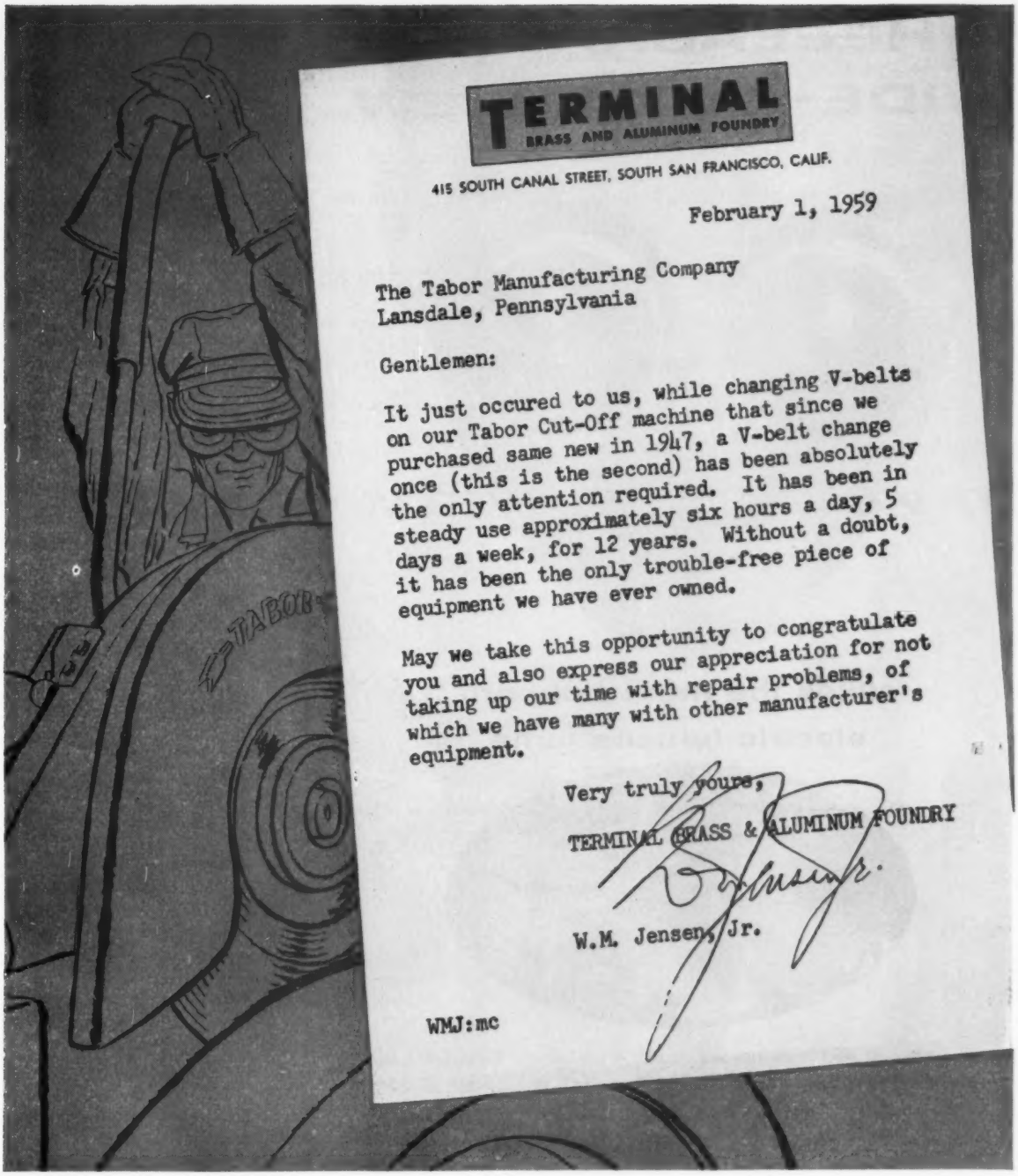
small as possible. The amount of slag in the cupola should not be excessive, and we control the slagging intervals by means of a stopwatch.

Gerhard Blumer
Rorbas-Freienstein,
Germany

Seeks Demonstration Furnace

To The Editors:

The Metropolitan Chapter of the


TERMINAL
BRASS AND ALUMINUM FOUNDRY
415 SOUTH CANAL STREET, SOUTH SAN FRANCISCO, CALIF.
February 1, 1959
The Tabor Manufacturing Company
Lansdale, Pennsylvania
Gentlemen:
It just occured to us, while changing V-belts on our Tabor Cut-Off machine that since we purchased same new in 1947, a V-belt change once (this is the second) has been absolutely the only attention required. It has been in steady use approximately six hours a day, 5 days a week, for 12 years. Without a doubt, it has been the only trouble-free piece of equipment we have ever owned.
May we take this opportunity to congratulate you and also express our appreciation for not taking up our time with repair problems, of which we have many with other manufacturer's equipment.
Very truly yours,
TERMINAL BRASS & ALUMINUM FOUNDRY
W.M. Jensen, Jr.
WMJ:mc
TABOR

To a busy foundry it is important that all equipment is in operating order at all times. Terminal found that with Tabor equipment there was no time lost repairing machinery or waiting for broken parts. Why not discover what Tabor means by "trouble-free" equipment? Talk to your Tabor Man or write for details to:

TABOR

TABOR MANUFACTURING CO.
Division of Turbo Machine Company
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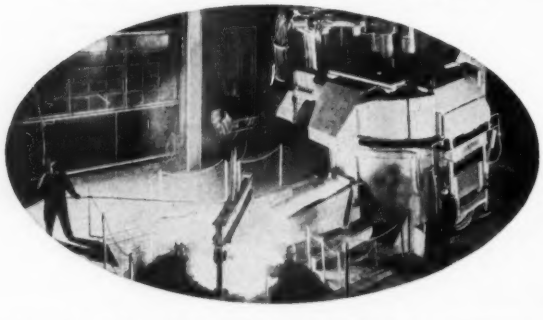
Circle 614 on Page 53

stifles the most stubborn electric furnace fume



In 27 prominent steel foundries and plants, Wheelabrator Dustube® Collectors handle a combined total of over a million c.f.m. of air, from 48 electric furnaces.

From the vantage point of this experience, Wheelabrator takes a "wide-angle" view of electric furnace fume control, to solve the most formidable problems of furnace hooding and ventilating, fume collection and disposal. Wheelabrator Dustube systems regularly achieve collection efficiencies above 99% and give a clean discharge. Take advantage of Wheelabrator's unmatched knowledge of electric furnace fume control.

Write today for complete information. Wheelabrator Corporation, 505 S. Byrkit St., Mishawaka, Indiana.

A Sound-Color Film on Electric Furnace Fume Control is available for showing to interested firms. Write for details.

DUST and FUME CONTROL

American Foundrymen's Society would like to acquire a melting furnace of approximately 50 to 100 lb capacity to present as a gift to the AFS Student Chapter at the Polytechnic Institute of Brooklyn. The furnace is to be for student use in melting cast iron and steel. Its capacity is not too significant. It is to be used for instructional purposes, melting a charge at a time sooner than continuous runs.

We would appreciate any help in putting us in contact with someone who might have melting equipment suitable for this purpose and who might be willing to donate it or sell it at a nominal price for educational purposes.

WILLIAM T. BOURKE
Chairman

Metropolitan Chapter, AFS
c/o American Brake Shoe Co.
Mahwah, N. J.

Editor's Note: We suggest that anyone interested in helping this project get in touch with the chapter chairman direct.

Detailed Information Available

TO THE EDITORS:

We noted that the first item in the department, Foundry Developments, in the March issue of FOUNDRY mentioned a paper on creep by Battelle, sponsored by the Brass and Bronze Ingot Institute.

We appreciate your mentioning of this article. Incidentally, at the same meeting an article covering mechanical properties on the same three alloys was presented which we believe has much interest to your readership.

We are enclosing copies of the two articles, and if you care to mention it, copies are available to your readers by writing to us.

Your interest is appreciated.

I. GLUECK
Secretary

Brass and Bronze Ingot Institute
308 *West Washington St.*
Chicago 6, *Ill.*

Editor's Note: Papers referred to are "Creep Properties of Three Low-Shrinkage, Copper-Base Casting Alloys," by W. F. Simmons and J. G. Kura, and "Mechanical and Physical Properties of Three Low-Shrinkage, Copper-Base Casting Alloys," by J. G. Kura and R. M. Lang. Brief summary of the latter was presented on page 134 in the October, 1958, issue.

Circle 613 on Page 53

Circle 612 on Page 53→

Pay less for more strength! Tenzaloy the self-aging aluminum alloy needs no heat treatment! If your aluminum castings are too large or too intricate for heat treatment, if your heat treating facilities are limited, if you need superior strength than you get from ordinary heat-treated alloy demand "Federated Tenzaloy" developed by Federated to meet the need for a superior aluminum alloy that ages at room temperature. Tenzaloy eliminates rejects due to warpage, expansion, and internal stresses caused by quenching. Tenzaloy finished properties are stable, proved by conclusive test data over a ten year period. No special foundry techniques are required. No fluxes. Castability is excellent with sand cast and plaster molds and many permanent molds. Tenzaloy will not "grow," produces corrosion-resistant castings with excellent polishing characteristics and anodizes clear white. Write for Tenzaloy Bulletin No. 103. Federated Metals Division, 120 Broadway, New York 5. In Canada: Federated Metals Canada, Ltd., Toronto and Montreal.

FEDERATED METALS DIVISION OF

ASARCO

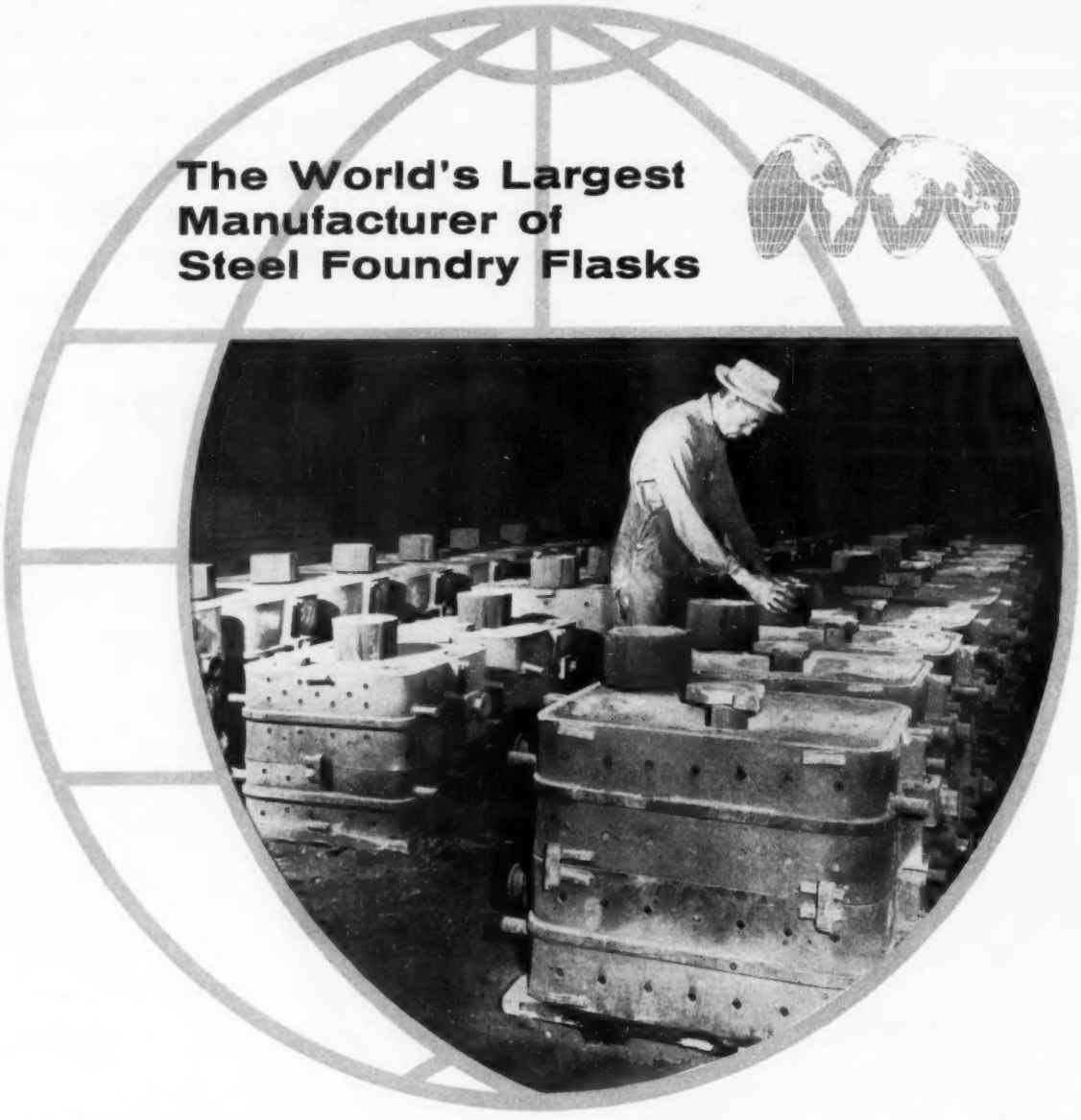
AMERICAN SMELTING AND REFINING COMPANY

TENZALOY is one of a complete series of Federated aluminum casting alloys. A new plant in Alton, Ill. will soon be in production to satisfy the requirements for Tenzaloy in the mid-west.

58-28

You can safely rely on Sterling

The World's Largest Manufacturer of Steel Foundry Flasks



The world's largest foundries turn to Sterling, the world's largest manufacturer of steel flasks, for their flask requirements. Why? Because Sterling's specialized experience in fabricating flasks for thousands of foundries is *priceless.*

For more than a half century, Sterling Steel Flasks have been regarded as the standard of comparison by most foundrymen. Made from special hot rolled steel channel — *not pressed steel* — these flasks have many life-prolonging features. Tensile strength ranges from 60,000 to 70,000 p.s.i. with controlled copper bearing and carbon content. You get extra heavy rolled-in sand retaining flanges with square corners and full width bearing. Partings are accurately machined to .005" precision. A center-rib is welded onto each section to fortify against torsional and other strains. Frankly, can you think of any other flask with ALL these features?

* * *

Write today for your copy of the Sterling Foundry Equipment catalog.

STERLING NATIONAL INDUSTRIES, Inc.
Founded 1904 as Sterling Wheelbarrow Co.
Milwaukee 14, Wisconsin, U. S. A.
Subsidiary Company: STERLING FOUNDRY SPECIALTIES LTD.
LONDON • BEDFORD • JARROW-on-TYNE, ENGLAND

A5-4531

WHEREVER METALS ARE CAST · FOUNDRY
May 1959

Stop Weeping

It must come as quite a shock to those recently predicting the demise of the foundry industry that demand for castings is moving up rapidly, that foundries are increasing operations, and that demand for foundry equipment and supplies is near record levels.

Foundrymen at the AFS Congress in Chicago were feeling good. Many reported five and six-day operations. Extra shifts are not uncommon. Customers need castings immediately, and it is felt this situation will continue. Improvement in casting demand extends fairly well across the industrial field.

Foundries are dusting off plans for improvement and expansion. Buying of new equipment already is under way. The FEMA index of orders for new equipment from foundries in February stood at 237, the highest since November, 1950. February sales were almost double the average rate of the last five years. Business in December, January, and February tripled that for the same months a year earlier.

Those crying about the health of the foundry industry should remember several important facts.

Because castings are basic engineering materials, foundries are sensitive to fluctuations in general business. If business during the next several years reaches the heights predicted by some economists, demand for castings will be exceedingly good.

Development of new materials and new processes has intensified competition for castings. Considering these developments, foundries have done well to show a growth in demand. Better castings and modern selling methods will improve this competitive situation for castings.

According to preliminary counts by *Penton's Foundry List*, the number of foundries going out of business during the last two years was about normal. The number entering the field was somewhat less than normal. Study of these closings shows that many did not keep up to date in either plant facilities or organization. Among captive shops calling it a day, the distance from the foundry to the board of directors frequently was too great. Plants were obsolete.

The foundry industry has made great progress. Modern foundries with alert organizations and an understanding of the importance of intelligent selling are going places.

Let's throw away the crying towel and get on with the hauling. The foundry industry is moving forward.

Frank G. Steinbach
Editor

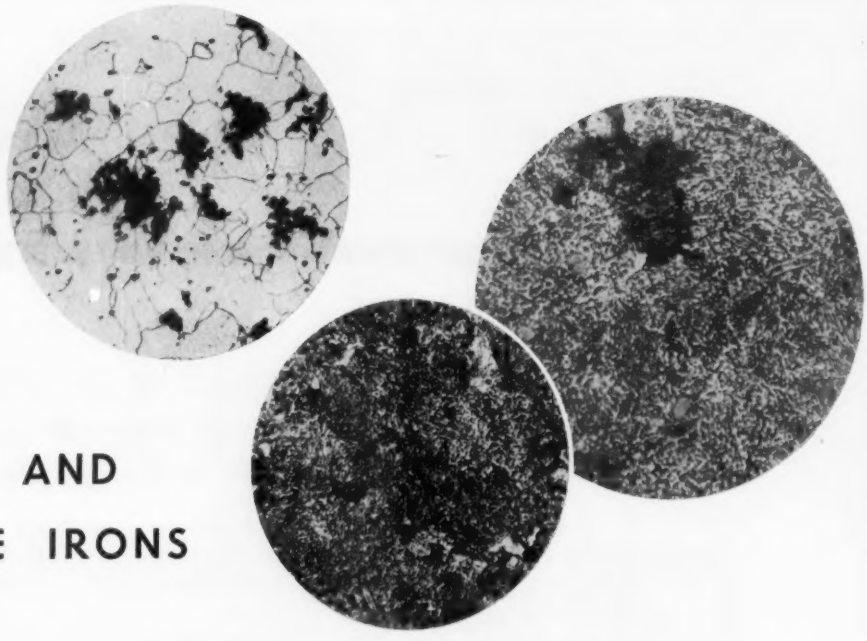


Fig. 1—Four microstructures at right are, left to right, grade 35018 ferritic malleable; 48005 pearlitic malleable; 80002 pearlitic malleable; and, far right, spheroidized pearlitic malleable

PEARLITIC AND MALLEABLE IRONS

Heat Treated Automatically

At Marion Malleable Iron Works, Marion, Ind., an automatic combination annealing and heat treating plant with atmosphere control produces both high-strength pearlitic and ferritic malleable irons

By LAWRENCE E. EMERY
Chief Metallurgist
Marion Malleable Iron Works
Marion, Ind.

● RECOGNIZING the potentialities of pearlitic malleable iron, the Marion Malleable Iron Works, Marion, Ind., a few years ago developed a program for an eventual castings production of 2400 net tons a month, including a substantial tonnage of ferritic, grade 35018, malleable iron.

The first step in the program was the installation of heat treating equipment. It has been in operation about 15 months and has a monthly production capacity of 800 tons of pearlitic malleable or any combination of ferritic and pearlitic iron up to 1000 tons. This equipment was installed under the direction of S. J. Walker, president of Chicago Railway Equipment Co., Chicago, parent company of Marion Malleable.

Choice of Equipment—Many factors govern the selection of modern short-cycle annealing and heat treating equipment for a specific malleable iron operation. Since Marion Malleable produces ferritic, grade 35018, malleable iron, and that grade forms the base for pearlitic malleable, the metallurgical aspects were important in choice of equipment. Consequently, considerable metallurgical research was carried on to determine the most favorable annealing and heat treatment cycles required. Additionally, a review of the shape and size of castings to be treated, metal analysis, limits of melting control, and foundry procedures was made.

The iron is produced in cupolas, forehearths, and reverberatory air furnaces. Its composition shows 2.35 to 2.50 per cent C, 1.30 to 1.40 per cent Si, 0.45 to 0.50 per cent Mn, 0.150 per cent max S, 0.05 per cent P, 0.05 per cent max Cr, 0.12 per cent max Cu, and 0.0015 per cent B. Iron composition is checked hourly at the cupola spout, and every 30 minutes at the air furnace for carbon content. Other chemistry of air furnace iron is checked hourly.

Typical characteristics relating to cupola operation include a melting rate of 26 tons per hour with an iron-coke ratio of 8:1. The 4000-lb charges consist of 40 per cent steel scrap, 50 per cent hard iron remelt, 5 per cent silvery pig iron, 1 per cent ferrosilicon, 3 per cent malleable iron scrap, and 0.5 per cent each of Ferrocarbo and spiegel pig. The metal is tapped at 2900° F from the air furnace for delivery to the pouring stations.

Treating Cycle—Based on melting practice, chemistry, and sections up to 3¼ in. to be treated, investigation led to development of a heat

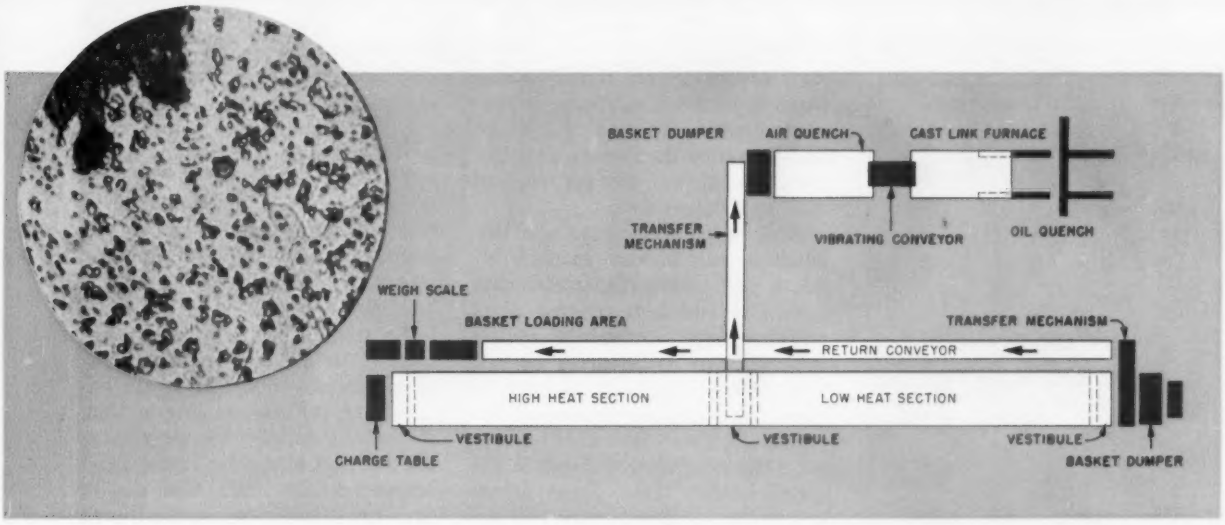


Fig. 2—Drawing shows arrangement of the company's combination annealing and heat treating plant, with atmosphere control

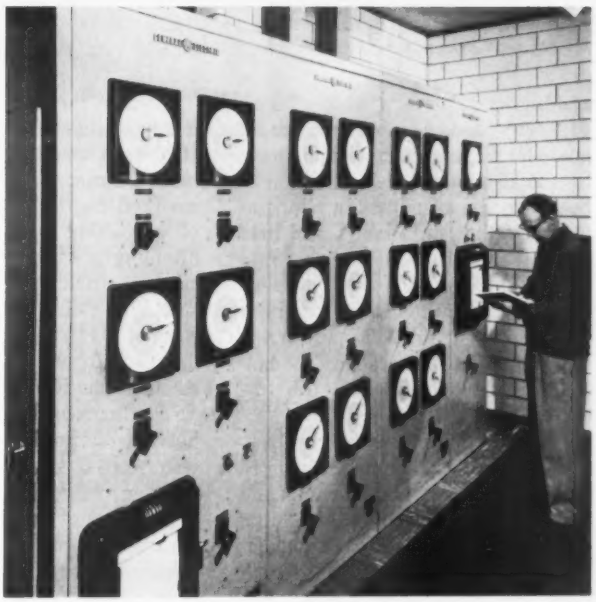


Fig. 3—Control room. First panel at the left contains control equipment for gas-fired cast link hardening and draw furnace. Two panels at the right control the 1000-ton furnace

Fig. 4—Castings are sprued and rough inspected on this conveyor line and placed in tote boxes which are carried by fork lift truck to the basket-loading area at the furnace

Fig. 5—At basket loading area, beside annealing furnace, the castings are packed in baskets

treating cycle with a maximum of 40 hours and a minimum of 32 hours for the regular malleable iron. In the maximum cycle the iron is heated to the austenitizing temperature (1750° F) in 5 hours, and held for 12 hours. It then is cooled rapidly to 1400° F, followed by slow cooling at the rate of 5° per hour from 1400° F to 1300° F. When that temperature is reached the material is discharged from the furnace.

Pearlitic malleable can be produced by these different procedures: Arrested anneal, air quenching and drawing; air quenching after first stage anneal, reheating, oil quenching and drawing; oil quenching after the first stage anneal and drawing, and complete malleablization, reheating oil quenching and drawing. Therefore, flexibility of heat treating equipment for application to any of those methods, as well as for processing regular ferritic malleable, became an important factor.

In addition to flexibilty, the following factors were given consideration: Fuel costs and availability, alloy costs, tray and furnace maintenance, instrumentation, atmosphere control, warpage of castings, ability to bank the furnace on weekends and holidays, cost per ton, and total installation cost.

After many field trips and discussions with furnace manufacturers, a new, automatic, combination annealing and heat treating plant complete with atmosphere control was designed by General Electric Co., Shelbyville, Ind., to produce both high-strength pearlitic and ferritic grade 35018 malleable irons to meet the requirements shown in the accompanying table. Some microstructures of those materials are shown in Fig. 1. Arrangement of the layout is shown in Fig. 2 while details may be seen in the accompanying illustrations.

Furnace Equipment—The equipment includes electrically heated 1000-ton capacity, split type roller-hearth furnace, an 800-ton capacity gas-fired cast-link conveyor furnace, oil quenching facilities, transfer and dumping mechanisms, and a 4000-cfhr nitrogen gas generator. The split type roller hearth furnace, the first of its type, is arranged with driven rolls for straight-line processing of the work.

The furnace is designed with two heating sections separated by a water-cooled vestibule containing a transfer table. This arrangement permits use of the first or high-temperature section for processing either ferritic or pearlitic iron. When the pearlitic process is to be used, the castings are diverted to an air quench chamber on a transfer table as they leave the high-temperature section. In the case of the ferritic malleable process, the castings continue through the vestibule into the low-temperature section for controlled slow cooling.

Inside dimensions of the first section are 76 ft long and 10 ft wide. Second section is 100 ft long and 10 ft wide, and total over-all length of the furnace is 220 ft. Heating is by ribbon-type resistance units. First or high-temperature section is divided into seven separately controlled zones with a total rating of 652 kw. The second or low-temperature section is divided into four separately controlled zones with a total rating of 240.

To provide controlled cooling of castings at the end of the high-temperature section and at the entrance of the slow-cooling section, air-cooled heat-resisting alloy tubes are installed above the castings and below the alloy rolls. One end of each tube in the two cooling units is attached to a common header which, in turn, is connected to a 1-hp motor-driven blower. A temperature control instrument for each cooling unit controls the respective blower. The cooling system makes it possible to reduce the temperature of the castings from 1675° to 1420° F in 20 minutes.

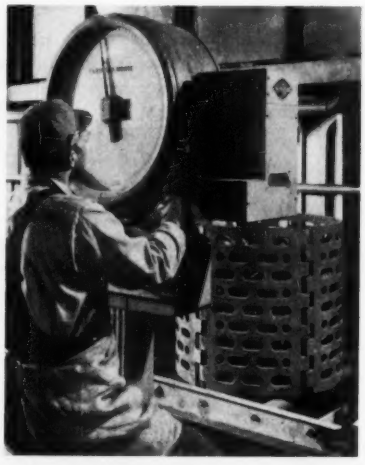


Fig. 6—After baskets have been loaded, they are print-weighed and transported to the furnace

Castings are carried through the furnace in alloy steel baskets 30 in. in diam and 27 in. high. Baskets contain 1100 lb of castings and move through the furnace in pairs, side by side. The furnace holds 140 baskets or 70 pairs. The baskets are carried through the furnace on alloy rolls spaced on 10 in. centers. Rolls in the high-temperature section are 6 in. in diam and those in the low-temperature section are 4 in. in diam. All bearings are water cooled, and water requirements—

Physical Properties of Ferritic and Pearlitic Malleable Irons

	Ferritic	Pearlitic						
ASTM grades	35018	45010	45007	45004	50007	53004	60003	80002
Tensile strength min., psi.	53,000	65,000	68,000	70,000	75,000	80,000	80,000	100,000
Yield strength min., psi.	35,000	45,000	45,000	45,000	50,000	53,000	60,000	80,000
Ratio, yield to tensile, %	66	69	66	64	67	66	75	80
Minimum elong., % in 2"	18	10	7	4	7	4	2	2
Modulus of elasticity in tension, psi.	25,000,000	25,000,000-28,000,000						
Ratio, fatigue strength to tensile strength	0.54	0.40-0.50						
Shear strength, % of tensile	80-90	70-85						
Torsional strength	Approximately equal to tensile strength							
Compressive strength, psi.	200,000	250,000						

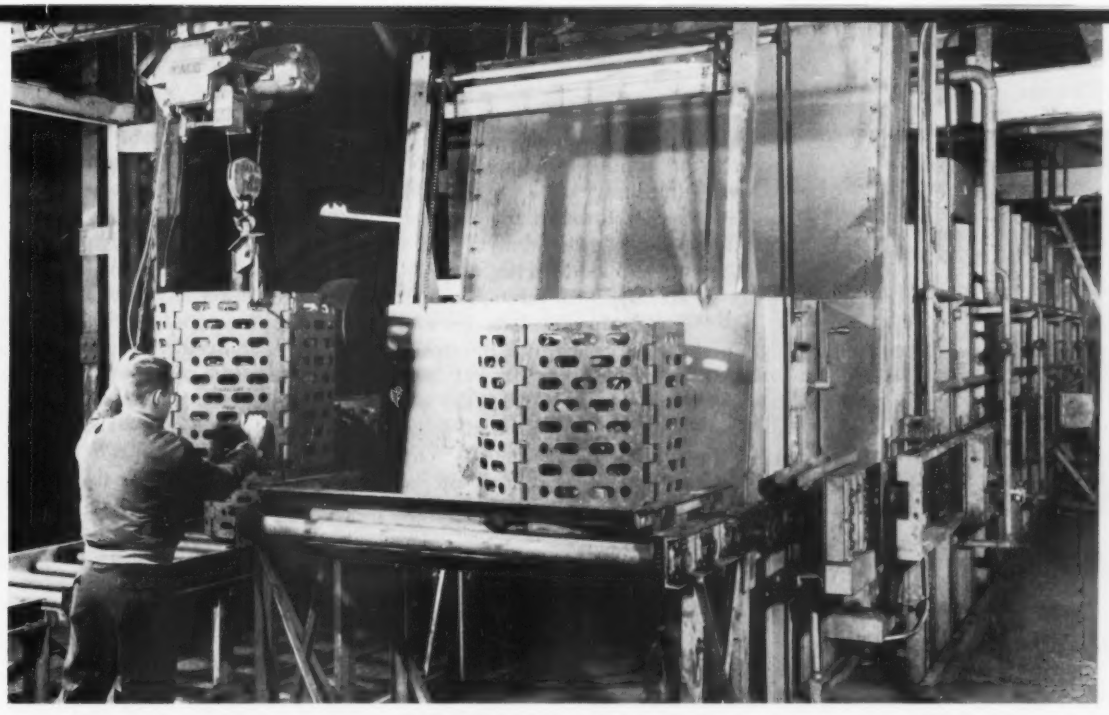


Fig. 7—At the charging end of the furnace, loaded baskets are picked up by an electrically operated hoist and placed on a driven roll in front of the furnace

including that for cooling the doors —are 1800 gallons per hr. Rolls are chain driven by a 1-hp motor through a speed reducer and speed change unit with a 6 to 1 range. Automatic takeup mechanism compensates for wear, stretching, and thermal effect on the drive chain. Auxiliary roll drives rated at 1 hp are at each end of the furnace to charge and discharge the baskets automatically. Roll drives are actuated by flag switches.

Shutdowns Avoided — To avoid shutting down the furnace for holidays, week ends, or slow periods when no work is available, a rocking drive is incorporated in the furnace design. The drive moves the baskets one diameter forward and then automatically reverses to move them one diameter backward. This arrangement prevents warping and sagging of rolls during stand-by. Prior to stand-by the baskets are spaced on a time basis so that they do not strike the doors at the ends of the furnace sections.

During the period, 2800 cfhr of dry nitrogen gas is introduced to prevent decarburization, and the furnace temperatures are reduced. Additionally, in event of a utility power failure, a gas-fired 10-kva electric generator has been installed as a standby unit for operation of doors, rolls, and atmosphere generating equipment.

Accurate temperature control of the process is maintained through 13 indicating controllers of the potentiometer type flush mounted in a control panel (Fig. 3). The instruments are equipped with thermocouple fail-safe devices. Thermocouples are enclosed in corrosion-resistant nickel-chromium alloy tubes for protection against gases and mechanical handling damage. Instrumentation is checked by the manufacturer, Leeds & Northrup Co., on a regular schedule.

Each zone has over-temperature protection provided by an extra thermocouple which is connected to a 16-point strip-chart recorder. Whenever the furnace temperature exceeds the instrument setting, the contacts are opened, causing the alarm circuit to operate and the main breaker switches on the transformer to open. The control is important in avoiding damage to heating elements and alloy rolls in the furnace.

The furnace for heat-treating pearlitic malleable employs a cast-link type alloy belt. Inside dimensions are 27 ft long and 4 ft high. It is fired with 18 nozzle premix natural gas burners placed above and below the belt. Burners are

Fig. 8—Water-cooled vestibule is between the high and low-temperature sections of the annealing furnace. Operator can see baskets

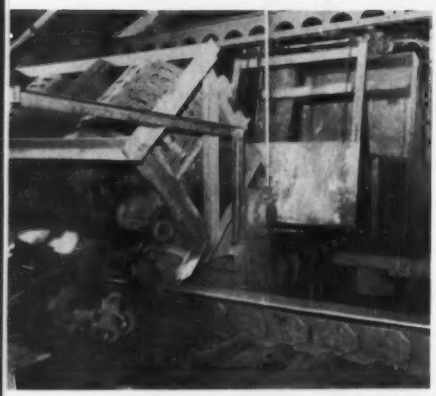


Fig. 9—At discharge end of the 1000-ton furnace, castings are dumped onto the sorting conveyor

sealed to the combustion chamber and only primary air from the blowers is used for combustion. Manual pilots used for lighting are constant-flame type to assure re-ignition in event of flame blowout.

The furnace utilizes an approved safety system employing a safety cock at each burner, in addition to a line safety shut-off valve which operates in case of failures in power, air, and fuel pressures through pressure valves in the air and fuel lines. The furnace is equipped with four temperature indicating controllers connected to a four-point recorder. Over-temperature and fail-safe equipment similar to that on the roller-hearth furnace also is used. Furnace capacity is 2200 net pounds of castings per hour or 800 tons a month.

Quenching Facilities — The air-quenching chamber consists of a double vibrating shaker which spreads the castings out uniformly during the quenching operation. After the castings are spread uniformly, the shaker oscillates at a reduced speed and carries the castings through the chamber. Rate of oscillation is controlled by a timer. Cooling is accomplished through three 120,000 cfm capacity fans in the roof of the furnace which direct air onto the castings. Contents of two baskets of iron or 2200 lb are quenched in this unit to 200° F in seven minutes. At the end of that time, castings are vibrated into a chute from which they can be plowed off and taken to a draw furnace or transferred to the cast-link heat treating furnace.

An oil quenching tank at the end of the heat treating furnace is below the floor level and has a capacity of 7200 gallons. Auxiliary equipment includes a tubular heater and water-cooled heat exchanger to maintain the oil temperature between 150 and 180° F, a heavy-duty propeller type mixer to agitate the oil, and a filter or strainer unit to remove scale, etc. from the oil. The entire oil quenching equipment is protected against fire by a foam system which is backed up by an overhead sprinkler system.

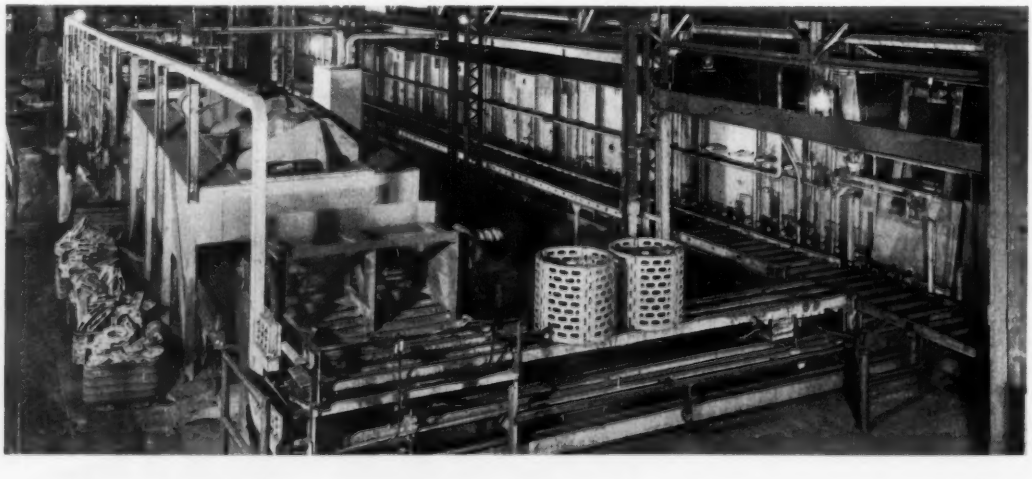
Dry nitrogen generator for supplying atmosphere control to the electric annealing furnace has a capacity of 4000 cfhr and presently around 3000 cfhr is being used. Gas has a dewpoint of minus 40° F and is formed by combustion of natural gas to a composition of 1 per cent CO, 1 per cent H, and 98 per cent N. About 80 per cent of the gas is introduced at the discharge door of the high-temperature section of the furnace and the remainder at the entrance to the low-temperature section. The generator includes an iron oxide tower to remove sulfur, a refrigeration type gas cooler, and two regenerative type gas driers which are used alternately.

Water requirement for cooling the complete installation is about 10,000 gallons per hr. Water is kept in a closed system comprised of a hot tank, a cold tank, and a cooling tower capable of maintaining the water at 85° F. Tanks are equipped with immersion heaters for maintaining constant temperature in extremely cold weather. The water system is chemically treated automatically, to keep the solid content at the proper level, and make up water also is added automatically.

Handling Castings—In operation, the castings are sprued and rough inspected on a conveyor line (Fig. 4), and the castings placed in tote boxes. Filled boxes are transported by fork-lift truck to the basket loading area alongside the annealing furnace (Fig. 5). There the castings are packed carefully in the baskets to prevent warpage or distortion when annealed, and also to attain the desired density of 1100 lb per basket.

After the baskets are loaded, they are print-weighed as indicated in Fig. 6 and conveyed to the charging end of the furnace. There they

Fig. 10—Cross conveyor where pearlitic malleable leaves first stage of the 1000-ton split furnace. The air-quench conveyor and the cast link furnace also can be seen, in the background



are picked up by an electrically operated hoist, Fig. 7, and placed on a driven roll table in front of the furnace. Two baskets are placed side by side on the table. This operation is the only manually directed handling of the baskets from charging to packing.

Every 40 minutes the front door of the furnace opens and two baskets of castings move into the vestibule to replace two others which previously had been moved into the high-temperature section of the furnace. In this section the castings are raised to a temperature of 1750° F in five hours and held at that temperature for 12 hours. Near the end of the high-temperature section the temperature of the castings is reduced rapidly to around 1400° F by means of air-cooled tubes incorporated in the furnace. Castings then move into the water-cooled vestibule, Fig. 8, between the high and low-temperature sections of the annealing furnace.

Ferritic Treatment—If the castings are to be converted into pearlitic malleable, they are moved out of the vestibule on a transfer table extending perpendicular to the furnace to undergo treatment which will be described later. Castings to be converted into ferritic malleable move through the vestibule into the low-temperature section of the furnace where their temperature is reduced from 1400° to 1300° F at the rate of 5° F per hour. Castings move into the exit vestibule on a roll table into a hydraulically operated dumping unit. Here the castings cool to a black heat and are dumped automatically onto a conveyor, Fig. 9. From the conveyor the castings are discharged into tote boxes and transported to the finishing department.

After the baskets are emptied, they rotate back to their original position, and are moved back automatically toward the furnace door where they strike a limit switch. This switch actuates a short chain-driven conveyor located perpendicular to the roll table which carries the baskets to the long power-driven return conveyor alongside the furnace. That conveyor moves the baskets to the loading area near the opposite end of the furnace.

Pearlitic Treatment—Castings to be converted into pearlitic malleable move on the transfer table, Fig. 10, to the hydraulically operated dumper shown in Fig. 11 which discharges them into the air quenching chamber. There the temperature of the castings is reduced to 200° F in 7 minutes by high-velocity air generated by three fans in the roof of the chamber. Cooled castings are discharged onto a short vibrating conveyor from which they can be raked off into tote boxes and taken to a draw furnace, or permitted to pass into the cast-link furnace for reheating and oil quenching.

In the cast-link furnace the castings are reheated to 1450° F in 1 hr. The belt travels at the rate of 13.6 ft per hr and discharges the castings 65 minutes later at a temperature of 1340° F through an oil-cooled snorkel tube into the oil-quench tank. Other belt speeds and temperatures may be used. From the oil quench the castings are removed by an apron conveyor, Fig. 12, and discharged into tote boxes which are conveyed to the draw furnace.

Additional equipment installed to improve the flow of hard iron from foundry to annealing department includes a new spruing conveyor, hard iron storage racks, and lift trucks, Fig. 4. These units have resulted in reduction of manpower and a smoother flow of product. Entire installation was made without loss of production.

This first phase in the modernization program of Marion Malleable Iron Works provides numerous advantages. They include improved quality of product, decreased annealing time and better delivery to customer, improved machinability through use of controlled atmosphere, over-all reduction in annealing costs, and reduction of labor requirements. Additionally, the installation gives flexibility to produce either ferritic or pearlitic malleable iron, and a much cleaner, orderly operation with improved working conditions.

The author desires to acknowledge the assistance of Stedman Studios, Ft. Wayne, Ind., and General Electric Co., Shelbyville, Ind., in preparation of this material.

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Fig. 11—Dumper discharges pearlitic malleable castings into the air-quenching chamber

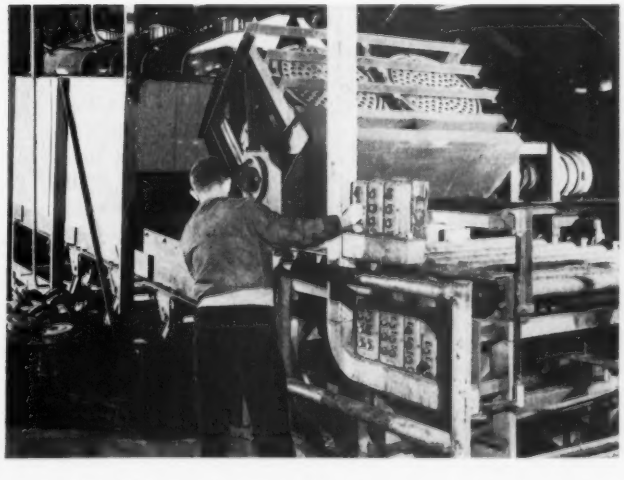
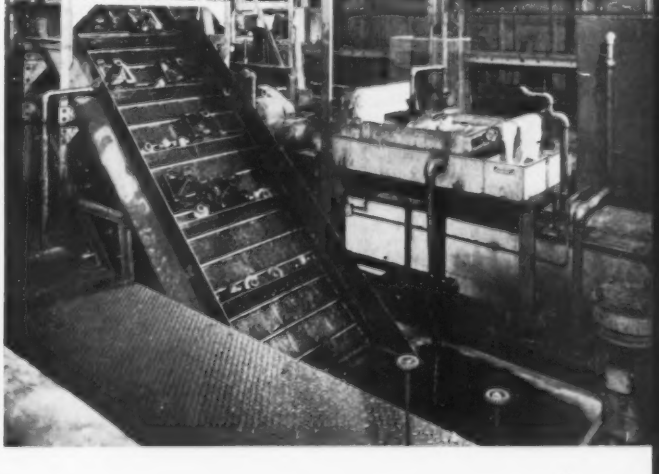


Fig. 12—Pearlitic malleable castings move from oil quench to tote boxes on this apron conveyor



VENTILATING

The Shell Mold Foundry

Revamping ventilating equipment at Lynchburg Foundry Co. was made necessary by developments in shellmaking equipment. The author describes changes that have been made

By WILLIAM H. PURYEAR
Engineer
Lynchburg Foundry Co.
Lynchburg, Va.

The large hood, top right, is one of three in the original ventilating system directing outside air to shot on cooling screens. No changes were made

● WHEN Lynchburg Foundry Co. was planning its shell molding foundry in 1952 and 1953, one of the main requirements was that the shop be virtually free of dust, fumes, and smoke. Consequently, ventilation installations were designed to complement the process equipment and the shell machines then available. Subsequent developments in shellmaking machines have forced the revamping of Lynchburg's basic ventilation system during the intervening years.

Original Installation—From the beginning, the planners recognized six major areas of heat, fume, and smoke concentration that would require ventilation. It was realized that as production increased, or as the basic process changed, other areas would need ventilation, but the first concern was to take care of these six areas: Forehearth and iron treatment, pour-off, casting cooling tunnel, shakeout, shot cooling, and shellmaking.

Smoke and fumes rise from the troughs and forehearths and from bull ladles when the molten iron is inoculated. To carry off the bulk of the forehearth and bull ladle smoke, the cupola building was designed with a natural stack 21 by 36 ft directly over the forehearths.

A slotted, side-entry exhaust hood extended 45 ft along the mold pour-off station. This hood had movable baffles to vary intake velocity at different points. A make-up air hood of the same basic design and length was mounted above the exhaust hood. The volume of exhausted air was 35,000 cfm, and 17,500 cfm of fresh air was brought in. Exhaust and supply fans serving the pour-off area were standard, pressure-type duct fans driven by direct-connected alternating-current motors.

Flasks containing poured shells move from pour-off into a long, covered tunnel for cooling. Two fans with combined capacity of 32,500 cfm exhausted smoke from the tunnel. Fresh air was supplied to the tunnel by two fans with combined capacity of 15,150 cfm.

Flasks emerging from the tunnel were dumped to an oscillating pan conveyor, and the smoke and dust were exhausted by a slotted side hood similar to that at the pour-off area. The hood had a capacity of about 15,000 cfm and was part of a central 37,000-cfm cyclone collector which accumulated dust from the shakeout, shot and sand elevator, shot and sand separating screen, shot storage tank, and shot elevator. Make-up air for the area was brought in through a duct terminating in a hood directly over the heads of the shakeout crew, providing 15,000 cfm of cool air at this hot work station.

In the shell foundry, cast iron shot was used to back up shells in the flasks. Naturally this shot got quite hot and had to be cooled before re-use. A complete shot cooling system was engineered in the initial installation. The hot shot, after separation from the sand and shell fragments, cascaded down and across three oscillating screens before going into storage. Beneath each screen was a 15,000 cfm exhaust fan to carry off the dust and heat, while above the three screens was a hood directing 40,000 cfm of cool, outside air across the oscillating bed of shot.

Finally air was exhausted at 25,-

The slotted, side-entry exhaust hood behind the ladle operators on the pour-off line was part of the original ventilating equipment

000 cfm from the ladle-heating station and fresh air supplied at 2,200 cfm.

The five areas (shot cooling, shakeout, cooling tunnel, pour-off, and forehearth) constituted the basic first floor ventilation system in the initial installation and gave a total exhaust of 174,500 cfm and a total make-up of 89,850 cfm. This excess of exhaust over make-up was not desirable, but it was decided to operate a few months before introducing any additional make-up air to see how much infiltration would occur, how effective it would be, and where the most judicious locations for introducing additional make-up air would be.

Molding Operations — Shellmaking operations on the second floor began with six machines: A four-station machine of our own design; a six-station machine of our own design, and four single-station, purchased machines. Since the shell molding process was in its infancy at that time, there was no way of knowing how much shell production equipment would be needed in the years to come, nor what types and sizes of machines would become commercially available.

Also, there was no way of knowing how well our own multiple station machines would function under the pressures of full production, nor how soon they would become obsolete. Therefore, our ventilation system for the shell making floor was installed on the "self-contained" principle. No attempt was made to exhaust and bring in fresh air for the whole area. Instead, a specific exhaust hood and make-up hood was installed for each machine (or pair of single-station machines, since they often were worked in pairs). Thus, if the machines were moved, regrouped, or modernized, the exhaust system could go right with the machine, and any new machines could be installed without interfering with the exhaust systems of existing machines.

Two main sources of dust and fumes exist during production of shell molds—application of the sand-resin mix onto the heated pattern and stripping the cured shell from the pattern. Hoods were placed to exhaust the dust and smoke from these two primary areas. This was relatively easy for the single-station machines. A simple rectangular hood extending from the left side of the applicator box to the end of the oven was adequate. To this was appended a small "hoodlet" which captured the applicator dust rising on the right side. The machines were shrouded extensively to minimize crosscurrent effects.

Placement of exhaust hoods for the multiple-station machines was more complicated because the machines were circular, and the applicator box was either 90 degrees or 180 degrees removed from the stripping station. The hoods were successfully curved around the machines, however, and we were able to achieve some shrouding of the applicator boxes. Each single station machine had an exhaust of 21,500 cfm by 24-in. and 30-in. duct fans. The four-station exhaust was by a 36-in. duct fan of 25,000 cfm capacity, and the six-station had a 48-in. fan of 38,000 cfm capacity.

Make-up air for the multiple station machines was provided by two 24-in. ducts which discharged into

the center of each machine. Fans of 12,000 cfm capacity provided the air. Operators of these machines stand at the stripper station, and, to provide localized cooling for each of these men, a small duct was run from each 24-in. make-up air duct, terminating in a small hood directly over the operator's head.

The four single-station machines were placed in a straight line on 16-ft centers. It was decided to have one common make-up air system for the four machines, designed so that the air supply to any machine could be cut off if not needed. The system consisted of four 16-ft long by 4-ft wide hoods the entire length of the four machines. These hoods were directly over work positions of the machine operators to provide cooling benefits as well as to provide make-up air for the room.

Air was supplied by two 48-in. duct fans, one at each end of the line of hoods, blowing toward the center. Each fan was rated at 36,000 cfm. The volume of air discharging from each of the four hoods was 18,000 cfm, and this volume could be varied over a wide range by simple dampers in the ducts leading to the hoods.

Early Changes—Shortly after the shell molding foundry started production in 1954 it was discovered that the natural draft in the stack over the forehearths was too slow in removing smoke—especially the tremendous quantity generated when we treated molten metal in the bull ladle to make ductile iron. To dissipate the smoke more rapidly, an exhaust hood was installed over the area where the bull ladle received iron from the forehearths and where the alloys were added. The hood and exhaust duct were a sheet metal worker's "nightmare" because the duct had to spiral around columns and between beams and over monorails to get up and out of the area. It connected into a 36-in. fan of 25,000 cfm capacity and was successful in carrying off the inoculation smoke rapidly.

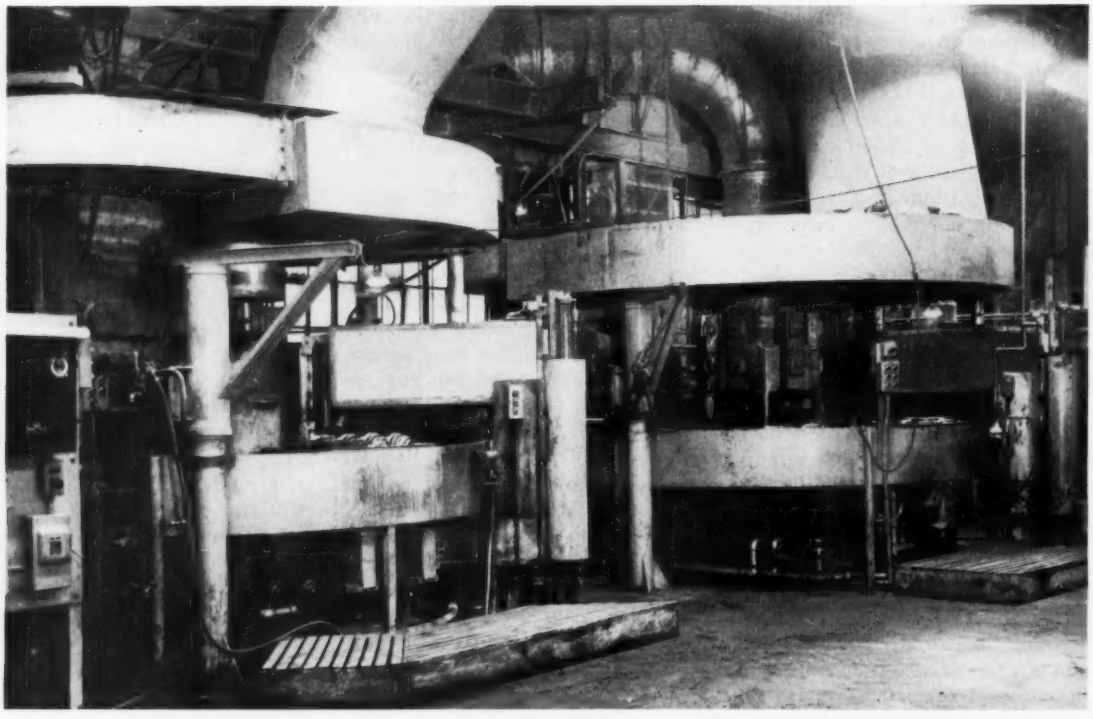
After several months' operation, it became apparent that two additional areas needed make-up air and cooling. First, the pour-off and iron-treatment areas, being relatively crowded and with a high concentration of heat, needed a blast of fresh air to provide local cooling and to push the smoke and heat out of the areas and into the stack over the forehearths. Second, there was practically no air movement in the area where the shells were placed in the flasks and the shot back-up added. In the summer months, placing still-warm shells into warmer flasks and filling with shot at 125 to 150° F was a very hot job.

In both the pour-off and bed-in areas we had the same fundamental problem—to provide localized man cooling and to pressurize the area and move the heat and/or smoke into the large, main exhaust stack. We installed a 60-in. fan high in the wall in each area and brought in 120,000 cfm of fresh air. Diffusers of our own design were installed in the inlets to direct the air up and down and side to side as required.

These changes brought the first floor ventilation system into near balance with 199,500 cfm exhaust and 209,850 cfm make-up air.

Molding Area Changes—In 1956

Original equipment included exhaust hoods over the four-station shell-molding machine, foreground, and the six-station machine, background



the company bought a two-station shellmaking machine. We installed a 3 x 12-ft exhaust hood to capture the applicator, stripper, and oven smoke and fumes. In front of this unit, and directly over the operator's head, we installed a 4 x 6-ft fresh air hood. Because of physical limitations of our shop and the location of existing coremaking equipment, we were unable to place this twin in line with the existing single-station machines but had to place it on the opposite side of the room.

The twin machine proved to be quite satisfactory for use in our jobbing operation, and subsequently we bought three more. We also purchased two more single-station machines and retired two of the older singles. Again, because of space limitations, we had to scatter the new machines at less than most desirable locations in the shop. Each new twin that was installed had its own exhaust hood and make-up air hood so any machine could be operated independently of the others as production requirements dictated.

This period of growth was rapid. Our main idea was to get shell production capacity into the shop. In the fall of 1957 we purchased two more two-station machines and retired all but two of the singles. Management decided to regroup the machines for efficient operation.

Make Extensive Changes — We now had two multiple-station machines, six twins and two singles. Our plan was to line up the six twins on the same side of the room where our original four singles had been. In the meantime, coremaking equipment, which originally had prevented placing twins in line with the singles, had been moved. So, in early December, 1957, we moved the six twins into a straight line and installed exhaust hoods and fans over each machine.

Total exhaust for the six twin machines was 56,000 cfm. Exhaust fans for the two single-station machines removed air at 50,000 cfm.

The four separate, in-line make-up air hoods for the original line of single-station machines were moved 2 ft farther into the room to accommodate the larger, twin machines. Two additional hoods were built and added to the line. The original 72,000 cfm now was split six ways, giving 12,000 cfm of fresh air to each twin. Each of the single-station machines was supplied with fresh air at 12,500 cfm.

Balancing the System—With the final machine layout completed, we turned to the volumetric balance problem. Our new exhaust capacity upstairs was now 169,000 cfm and the make-up was 121,000 cfm leaving a deficiency of 48,000 cfm. To make up this deficiency, we installed three 54-in. wall fans in one end of the shellmaking department.

Two of these fans were installed high in the monitor of the building and primarily were intended to pressurize the building to prevent hot air from coming up from the cupola, pour-off, and bed-in areas downstairs. The third was placed in a wall and was equipped with diffusers so that it could be used for man cooling as well as pressurizing. These three fans have a combined capacity of 135,000 cfm, giving the upstairs 256,000 cfm, an excess of intake over exhaust of 87,000 cfm.

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Newly installed diffuser admits 45,000 cfm of air into shellmaking area. Louvers direct air in four directions

Contaminated air at the shakeout is exhausted through the side-entry hood shown at left in the illustration below

DYNAMIC LOADING

. . . Its Effect on Casting Design

Part 2

This article is the second of two in which the author discusses use of proper design to minimize stress concentration in castings which undergo dynamic loading

By JOHN B. CAINE
Foundry Consultant
Cincinnati

TYPE OF JUNCTION	STRESS CONCENTRATION	THERMAL GRADIENTS, CASTABILITY	SOLUTION
X	Infinite. Triaxial stress if all four arms are loaded equally	Worst of simple junctions. Liquid metal throughout when arms are completely solid	Simplify to staggered T junction
STAGGERED T (T1 MIN., 1½r)	1.1-1.2 if r=1t. Triaxial stress is relieved by local bending	If r is greater than 0.5t, there is an envelope of solid metal at the fillets when arms solidify	
T	1.1-1.2 if r=1t	Same as staggered T	L junction is better
L (1½r, 2½r)	Under 1.1 when r_1=1t, r_2=2t	Best. Thermal gradients almost the same as in uniform section	
X T	Not too great; maximum stress is away from fillets. Ribs always cause stress concentration	Inherits all the evils of both X and T junctions. Worst castability of any junction	Should be simplified to C or U section or web corrugated
CORRUGATED WEB	Can be designed with equal or higher properties than X-T	X junction is eliminated, but it still has two T junctions	Best if an I-beam shape is needed
K	Stress concentration depends on how loaded. Can be high	Hot spot at the acute angle is even worse than the X junction	Simplify to L-T junction
LT (1½r, 1½r, 2½r)	If 1t-2t radiuses are used, stress concentration should be about 1.1-1.2	As castable as the L and T single junctions	

Fig. 10—Recommended simplification of complex junctions to reduce stress concentration

● INFORMATION on how thermal gradients influence castability of L and T junctions fits in nicely with stress concentration data.[13]

In every case castability of a part improves when section shapes and junctions are designed for decreased stress concentration. This situation is true for all the simpler junctions of sections discussed in the first part of this article (FOUNDRY, April 1959, pp. 166-176) and should be true for the more complicated K and X junctions and combinations like the X-T junction.

Little or no experimental data are available for the more complex junctions. However, simple extrapolation of the data given in the first instalment of this article should be convincing proof that these more complicated junctions exhibit greater stress concentration than the simpler junctions.

Because these more complicated junctions almost always can be simplified to T and L junctions, simplification is the best solution to the mutual problem of stress concentration and castability.

A scheme of simplification is given in Fig. 10. These recommendations are based on equal, or nearly equal, sections. If the sections are unequal, stress concentration data indicate that the fillet radius should

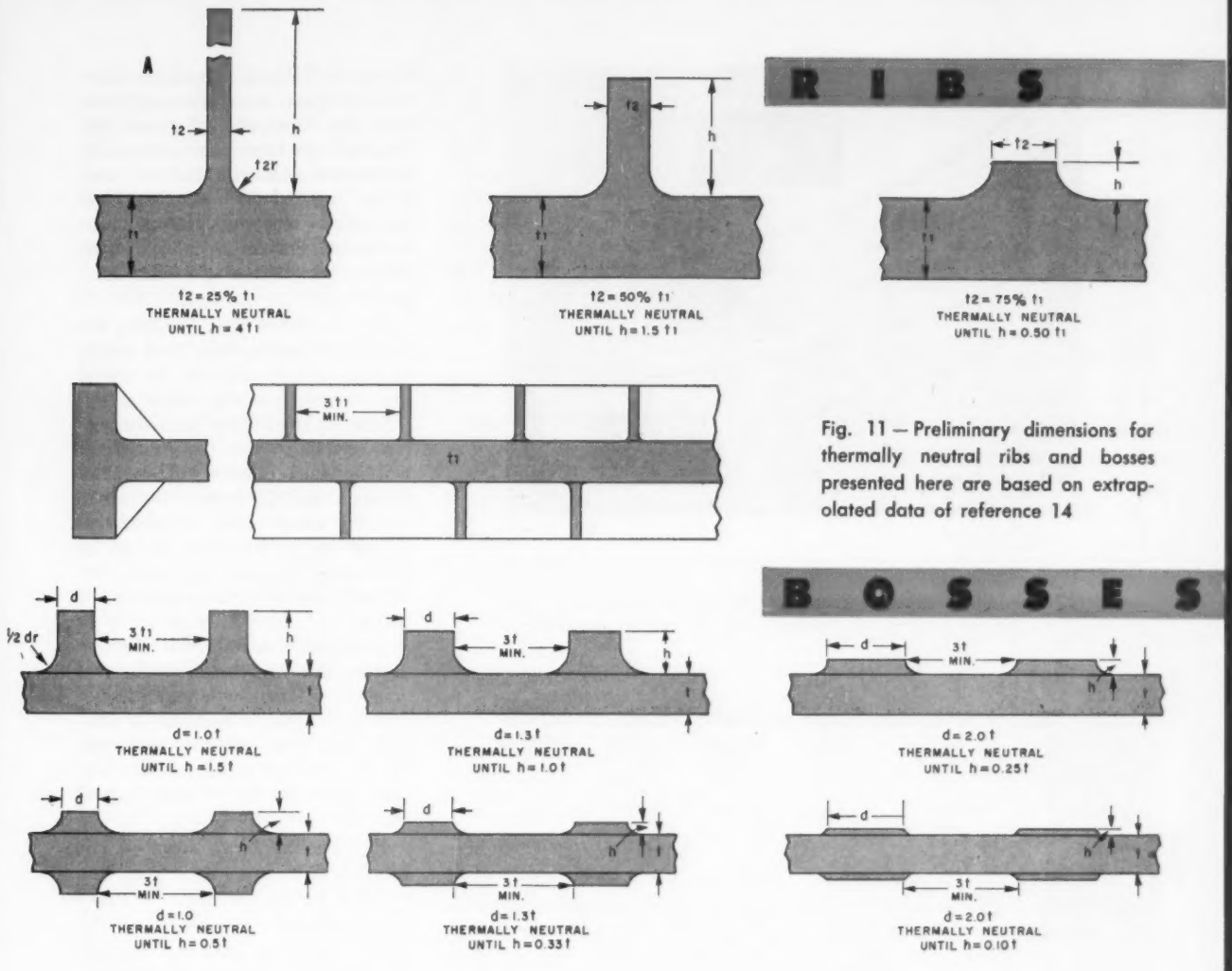


Fig. 11 — Preliminary dimensions for thermally neutral ribs and bosses presented here are based on extrapolated data of reference 14

be based on the smaller section, but this is subject to experimental confirmation. If the sections differ widely in thickness, design can take advantage of "thermally neutral" junctions. If T junctions are proportioned as shown in Fig. 11, the junction solidifies at the same rate as the thicker member, solving many castability problems with metals of high apparent shrinkage.[14]

The junction of Fig. 11A particularly is adapted to stiffening ribs and brackets. Such ribs always are suspected of increasing stress concentration, but, if they must be used, a simple rule is to make the rib section 25 per cent of the section of the main member, unless this rule results in a section too thin to cast in the metal to be used. Regardless of rib thickness, it is always advisable to stagger the ribs, as shown in Fig. 11.

A specialized form of the T junction is the boss, or finished pad. It should be possible to dimension such bosses so they are thermally neutral in relation to the main section, as shown in Fig. 11. If this is done, shrinkage defects will be minimized and the cost of chills and special risering decreased. The data on which the recommendations of Fig. 11 are based are specific only for steel but should apply to all metals. The recommendations are based on heat transfer data and to date have not been checked in production. Some testing, especially of the extrapolated values, should be done before the specific dimensions are accepted as final.

Holes Raise Stress—An unexpected possible source of high stress concentration is a hole in a flat plate, as shown in Fig. 12. Theoretical stress concentration in tension (K_t) can reach a value of 3.0 and can reach a value of over 2.6 times the over-all stress in bending. These values are higher than any given previously for other shapes. A few reported decreases in fatigue strength (K_f) are lower than the theoretical values of K_t, as shown by the x's in Fig. 12. However, the decrease in fatigue strength still is substantial—30 to 50 per cent. One solution, well adapted to casting, is the reinforcing boss. The decrease in stress concentration for one such boss is shown in Fig. 12 as being substantial. These bosses can be proportioned according to the recommendations of Fig. 11.

Theoretical stress concentration induced by a hole in a round, when stressed in torsion and in bending is shown in Fig. 13. There is a direct qualitative comparison between these theoretical relations and service performance of crankshafts with oil holes. It is common knowledge that an oil hole with sharp corners is almost certain to start fatigue cracks. It is also common knowledge that if the edges of these holes are chamfered (even after fatigue

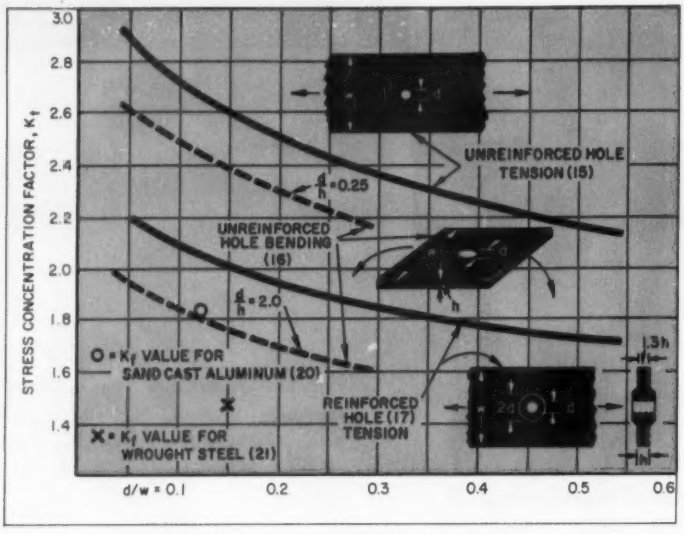


Fig. 12—Theoretical stress concentration induced by a hole in a flat plate stressed in tension. Reference numbers are in parentheses

TABLE I—Effect of Corner Shape on Static Design Properties

"L" Section	Area or Weight	Moment of Inertia	Section Modulus	Radius of Gyration
Square corner	100%	100%	100%	100%
1t-2t round corner	93%	87%	71%	92%
1t-2t round corner with metal of corner added to outer leg	100%	99%	79%	99%

cracks are started) to remove the fatigue cracks, the crankshaft will last indefinitely. If the oil holes are not chamfered, the fatigue cracks shortly will rupture the shaft. The decrease in fatigue strength of steel (K_f) is shown by the x's in Fig. 13 as being close to the theoretical values.

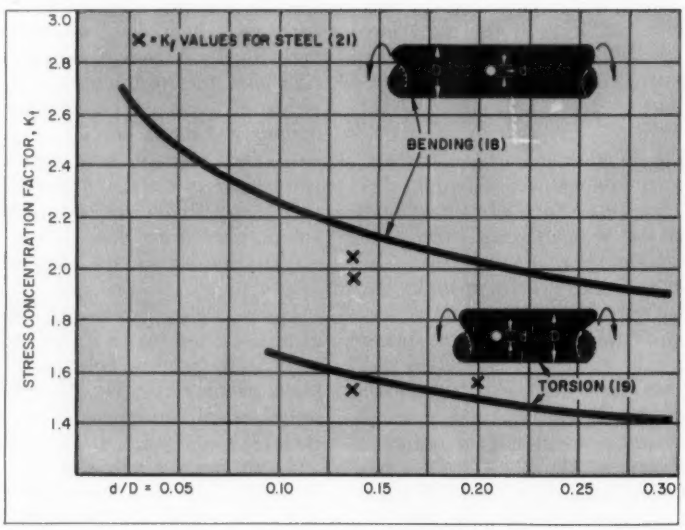
This information indicates that the holes in flat plates like those shown in Fig. 12 also can be strengthened by rounding the edges. This can be done easily in a casting (with or without the reinforcing boss) by making the core print larger than the diameter of the hole casting the radius. Even though the hole is reamed, a round corner with a cast surface should be stronger than a sharp machined corner. If the corners of the hole must be sharp (at the expense of strength), the rounded cast corners can be dimensioned so they machine out.

Stresses at Corners—This discussion of stress concentration and actual fatigue at sharp corners accents a most fundamental point. What is the stress concentration at a corner of a square or rectangle? A rather extensive search of the literature has disclosed nothing. Nevertheless, much practical experience indicates that sharp corners are severe stress raisers. The oil hole just discussed is one example. Another is the rapid decrease in moment of inertia and section modulus when the corner is rounded, as shown in Table I. Available thermal analyses data are significant from the standpoint of castability. Thermal gradients and castability follow stress concentration so closely in "L" and "T" junctions that it does not seem too presumptuous to assume that stress concentration follows the thermal gradients in a corner.

Fig. 14 shows that breaking the corners of cast sections to a radius of 0.1t to 0.2t removes the metal that is cooling at the end of solidification of steel faster than the surface metal of the plane surfaces making the corner.[23] The metal between the 20-second isochrome and the sharp corner is cooling at a rate up to 10 times as fast as the metal between the same isochrome and the surfaces making the corner. If the corner is made of a hardenable metal, this extreme thermal gradient can cause thermal cracking. This is true regardless of how the corner is formed. A thermal crack plus a sharp corner really induces stress concentration. The junk yards are full of scrap caused only by this combination.

Problem in Gray Iron — The problem is accentuated in gray iron castings by chilled edges. Chilled edges become important to the point that they limit the strength of iron used in the casting. All sorts of cures have been used. All involve alloying, heat treatment, and composition. All increase cost.

Fig. 13—Theoretical stress concentration induced by a hole in a round stressed in torsion and bending. Reference numbers are in parentheses



Why not eliminate the corner? Perhaps radiuses larger than the 0.1t-0.2t will be required, up to 0.5t. These rounded corners are cast easily. The only objection to their use is the decrease in moment of inertia that, in most instances, can be satisfied by moving the metal in the sharp corner to a spot where it will contribute to load-carrying capacity and cool at a rate not too much faster than the section as a whole.

Rounded external corners are cast easily. In most instances only a piece of sandpaper and a simple template are needed to break the corners on the pattern to 0.2t, or 0.5t radius. This radius need not be precise. There are only two exceptions—when the corner is at the parting of the mold and when a core is supported by a core print. Rounded corners can be cast at these locations if specified before the pattern is made. After the pattern is made, rounding these corners often means new pattern equipment. All drawings and orders for patterns should incorporate a notation that corners should be broken to 0.1t-0.2t radius, or to 0.5t radius. This little notation will increase service strength of castings more, for less money, than any alloy or heat treatment in the book.

Summary — Fillet radiuses at junctions of sections should be equal to or greater than the section thickness (t). If large radiuses cannot be used, efficient design requires the imposition of compressive stress in the fillet.

The L junction with 1t-2t radiuses is a most desirable cast junction from the standpoint of section modulus, stress concentration, and castability, and should be used if at all possible.

If section modulus is relatively unimportant or can be increased any other way, larger radiuses should be used. Radiuses larger than 1t-2t particularly are important when the simple junctions discussed in this article are joined to make usable castings.

Cast external corners should be broken to 0.1t-0.2t radius. Gray iron may require larger radiuses, up to 0.5t.

It is to everyone's advantage to simplify more complicated junctions. It is surprising how much simplification can be done with just a little thought. Fig. 10 can be used as a guide.

If stiffening ribs must be used, the ribs should be proportioned to 25 per cent of the thickness of the main member unless the rib section is too thin to cast.

Finishing pads and bosses should be proportioned according to the recommendations of Fig. 11 if possible.

The next step, the combination of junctions discussed in this article into some cast sections, will be discussed in a future article.

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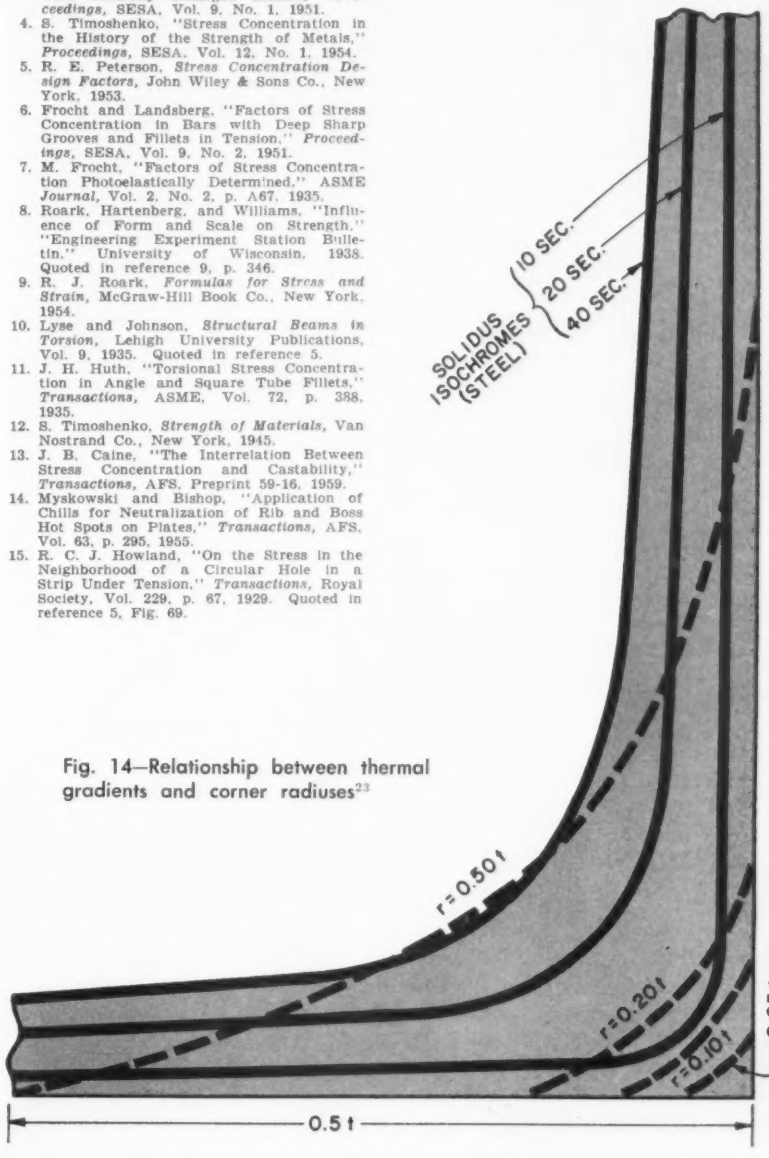


Fig. 14—Relationship between thermal gradients and corner radiuses[23]

Molding and Pouring

. . . Large Steel Castings

Consistency and uniformity are vital in good sand practice. Every possible control should be used. Each removes another phase of guesswork or another possible variable

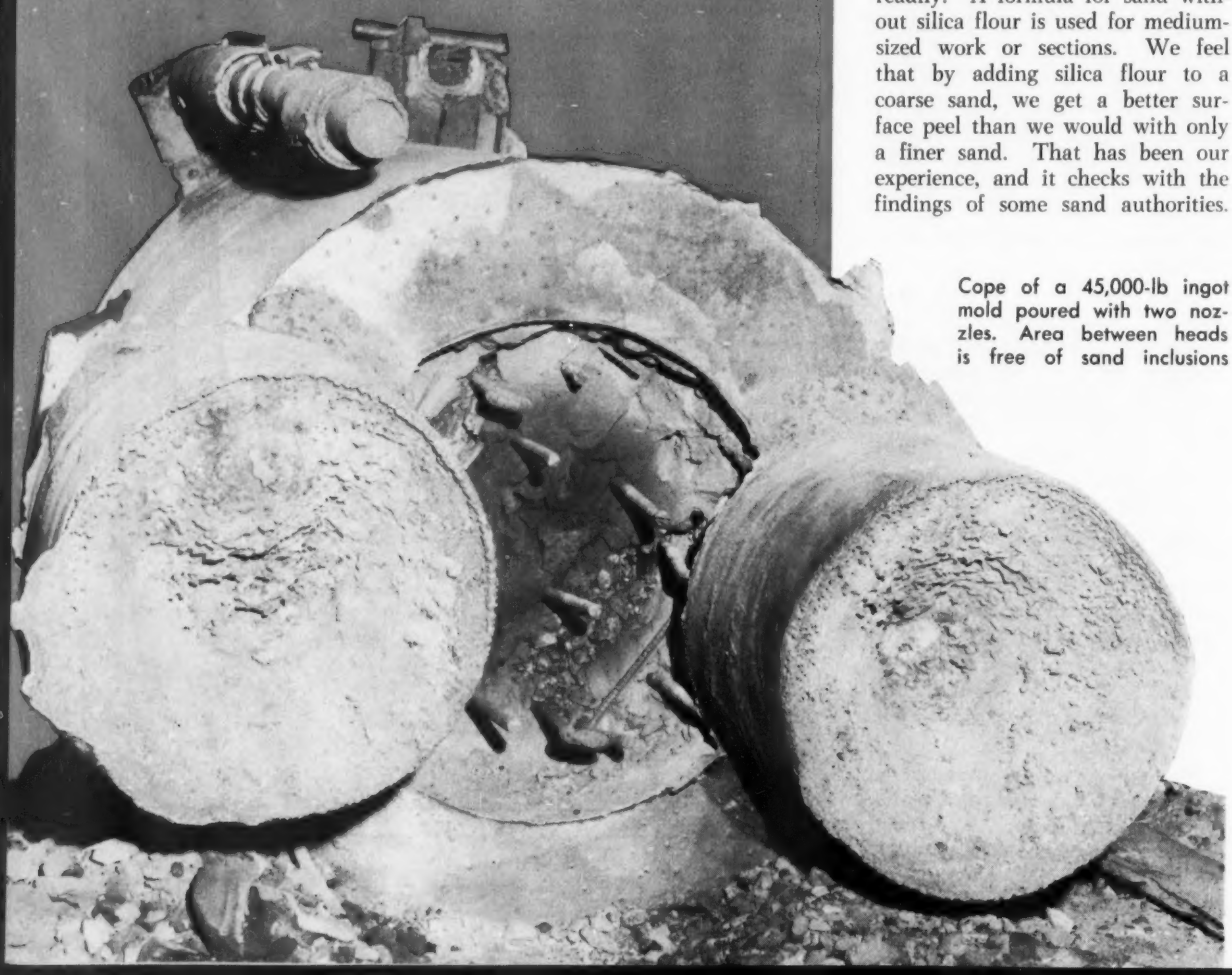
By HUBERT CHAPPIE
Foundry Superintendent
National Supply Co.,
a subsidiary of Armco Steel Corp.
Torrance, Calif.

● SAND for the production of steel castings should be uniform and have consistent properties.

We use three-screen Ottawa sand with 48 to 53 AFS fineness. If the sand is out of the range of 48 to 53, it is rejected, but during the last five years we have rejected only one car. Although we are in no position to say our results would be bad if we accepted a 55 AFS sand, this policy does let the supplier know that we are quality conscious and practice controls.

The individual foundry must decide whether to use a three, four, or five-screen sand, and each type has its advocates. As far as I know, however, there is no agreement as to which is the most satisfactory. Because we have used a three-screen sand for years and do not have any proof that four-screen or five-screen has advantages, we prefer to stay with the three-screen sand.

Since we make castings up to 50,000 lb net weight, we add silica flour to the 48 to 53 sand. We believe that such a sand has some advantage for this large work in that it is more permeable than a finer sand and can be dried more readily. A formula for sand without silica flour is used for medium-sized work or sections. We feel that by adding silica flour to a coarse sand, we get a better surface peel than we would with only a finer sand. That has been our experience, and it checks with the findings of some sand authorities.



Cope of a 45,000-lb ingot mold poured with two nozzles. Area between heads is free of sand inclusions

It is true that the finer sand produces smoother surfaces on castings, but better controls and perhaps additional venting are necessary to avoid blow holes.

Preparation—Our sand formulas are typed for the muller operator. Before the sand enters the muller, it is weighed in a hopper, then released onto a belt which carries it to the mill. All ingredients are weighed accurately, and a meter gage measures the amount of water added.

Water Causes Defects—The most important ingredient in our sand is water. Although it is the most plentiful and cheapest, it can be expensive when we consider the defects moisture can produce. For example, carbon monoxide in sand is caused by moisture, and it, in turn, creates gaseous penetration. Too much water can cause scabs, buckles, penetration, blow holes, and a host of other defects.

It also is important to remember that water varies in different locations of the country and that the same amount will not produce the same Baume with the same ingredients. Varying the percentage of water changes the properties of sand.

Green Strength—To mold or handle sand, we must have a certain amount of green strength or workability. This usually is achieved with cereal, fire clay, bentonite, and other additives. So many are available that one should proceed cautiously and evaluate carefully before using a new product.

The value placed on green strength by foundries is so varied that one wonders how the resulting casting finish can be of similar quality. Some foundries like low green strength, which gives good flowability, and others have as high as 10-psi green strength, which results in poor flowability. With large castings, sand with high green strength usually does not produce scabs. Low green strength and good flowability are much more apt to produce them.

Some time ago I studied sand formulas from approximately 25 foundries and found that moisture, permeability, green strength, and dry strength varied tremendously. Certainly these wide ranges must produce extreme variations in casting surfaces. Again, who can say which is the perfect mix?

Permeability—Sand permeability is important. It should be measured after the sand has been rammed. High permeability permits gases to escape readily, and low permeability sand provides a smoother finish. With dry sand molds, however, low permeability requires greater drying time. Low-permeability sand also can contribute to setting up cracks because it resists contraction. If possible, the backing sand should be 150 permeability or better to allow gases to escape from the mold readily.

Density—Density is important to counteract penetration. In our 48 to 53 fineness sand, maximum density is reached with approximately 30 per cent silica flour. Zircon sand of 115 AFS fineness also requires 30 per cent zircon flour to reach maximum density. This density should be used only when one has a severe penetration problem. Low permeability and hard ramming improve the density.

Expansion — Sand expansion, which usually is high when the sand is loaded with silica flour, certainly contributes to cracks. Zircon sand has very little expansion. The use of cellulose materials in the sand absorbs contraction of the casting, and this material aids in reducing cracks. Cores made entirely of green sand or with only the upper portion of green sand do an excellent job of collapsing and reduce or eliminate cracks entirely.

The power of green sand to reduce cracks should not be underestimated. Cores made entirely of green sand have been used to combat cracking, but ordinarily a core with the cope part made in green sand eliminates this problem. A remarkable demonstration of the value of a green-topped core involved what is known as a smokestack casting. It was of double-barreled design, about 30-in. in diameter and 4 ft long, with a heavy web of metal between the two diameters. Made with a dry sand core, the casting cracked practically in two pieces at the web section. Use of a green-topped core, however, produced a casting free from cracks.

Many Formulas Necessary—The many additives used in sand cause its properties to vary greatly. A formula ideally suited for one analysis of steel may not be applicable to another. Also, one must know whether he wants a sand to resist cracks or to have maximum collapsibility. Most foundries have at least 10 to 20 sand formulas, each suited to a certain condition.

View of 45,000-lb ingot mold shows surface before it was sandblasted

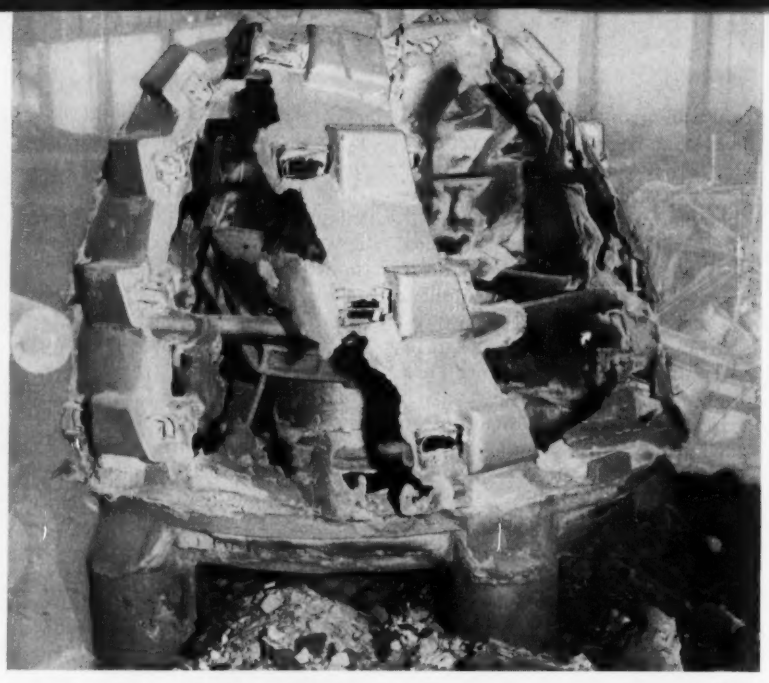
We employ a full-time sand technician who spot checks sand batches for moisture, green strength, and permeability. Weekly checks are made on fineness and clay content of our wet sand reclamation, and a dilatometer is used to check new sand formulas for hot strength. At the end of a day, the sand technician gives the foundry superintendent a report of all sand tested during the day. The superintendent thus can observe any changes taking place in the sand formulas.

Olivine and Zircon Sands—Olivine sand has proved itself ideally suited for making 14 per cent manganese steel castings and for use as a ladle lining. Zircon sand repeatedly has proved its value in the making of large castings. It is used in cores to eliminate penetration when a heavy section of metal surrounds the cores. A further use is in pockets, or where the metal strikes the sand when it is poured into a head instead of a gate.

Zircon is expensive, and, since its density is almost twice as great, it covers only half the area of silica sand. Notwithstanding, it still is a real asset in producing large cast-

ings and cores, and reduction in cleaning time can make substantial savings. Zircon sand produces a superior surface appearance which has tremendous eye appeal to any customer.

The binders variously known as cold-setting, air-setting, or self-curing are gaining momentum, and they permit some real manhour savings in the coreroom and molding department. Since sand with this type of binder does not require any ramming, it also prolongs the life of coreboxes and patterns. Because the cores set in the corebox, fewer gaggers are needed to support the core in the green stage. This reduction tends to decrease cracking tendencies in the core areas. The more gagger rods used, the more expansion takes place when the rods are heated; core rods at 1200° F expand ⅛ in. per foot. Our experience has shown a great deal of promise, and we are continuing to explore the possibility of making more cores with this type of binder.



View shows the surface of a 10,000-lb rock cutter casting at the shakeout

Mold Ramming—Ramming is important for two reasons: 1. Making a mold which will resist penetrations. 2. Making a casting with good eye appeal. Soft ramming allows the sand to erode when the metal passes over it, thus causing sand inclusions in the casting. An instrument is available which checks mold hardness quickly. It can be carried in the supervisor's pocket. Molds which check from 70 to 80 are quite satisfactory. On large molds, however, we reach a hardness of 80 to 90.

Troweling — When a molder trowels a mold, the hardness immediately increases 10 to 15 points. We have found that slicking a mold with a trowel invariably produces a scab on the casting. Sometimes when a corner is broken on a large mold, we do cut the extra piece of steel off the casting rather than patch the mold. This scabbing as a result of troweling is very apparent when we use silica flour in our sand. In some other mixes, troweling does not increase mold hardness, and the casting does not scab. With high-flowability sand, scabbing tends to occur on a casting which has been rammed too hard.

Gating—Gating can have a drastic effect on sand erosion, which contributes to sand inclusions. The use of one ingate, where all the metal passes over the same surface, invariably causes erosion or penetration. It always is better to have two or more ingates so that the metal is better distributed as it enters a casting. In pouring castings 10 ft or more in diameter, we usually use six to eight gates to divide the area in which the metal passes over the sand. We also reduce the temperature of the metal entering the mold by spreading the metal over more gate area.

Gates cut by hand cause more erosion than a rammed gate. The sand of which the gate is made should be the very best, and the manner in which the gate and sprue are made also is important. If the gate area is too thin and will not take the metal freely, erosion may occur.

In many foundries, sand inclusions stem from faulty gates. The one sure way to correct this condition is to eliminate the gate and pour into a head. We have poured molds into a head in castings weighing as much as 10,000 lb, and we are increasing this practice. We usually place zircon sand where the metal drops into the mold. Head pouring is not as likely to cause sand inclusions as a gate because the head size is so large that the ladleman should have no difficulty pouring without touching the sides of the head.

In making large castings, we also use bottom gates, in which the metal drops considerably but does not tend to cause erosion as much as a parting gate. Swirl gates are not used in our foundry. Some foundries use swirl gates and as high as four to six slag or sand traps before metal reaches the casting. Since we admit that a swirl gate is used to trap loose sand, it would be better to spend more time to correct faulty sand practices and sand formulas to prevent this loose sand from flowing into the gates. A wide variety of swirl gates is used in the industry, and the Steel Founders' Society of America has printed valuable information regarding them.

Mold Drying—Drying of molds, especially large ones, is important in the reduction of sand inclusions. Depending on section thickness, average castings or cores are dried overnight, but some cores are dried for two days and nights. The best way to determine how long to dry molds is to evaluate the castings in the cleaning room. If some sand defects seem to be caused by quick drying, increase the drying time and look for improved effects.

Good portable dryers are on the market today to dry large molds. It was common practice not long ago to dry pit molds with gas torches and cover them with sheet

steel. Sometimes molds were dried for a week; today we dry the same type of molds overnight, or at best for 16 to 24 hours, with much better results.

After drying molds, pour them as soon as possible. Do not use cold cores in a hot mold, or moisture due to condensation may cause the sand to break down. The ideal condition is a warm core and a warm mold but, of course, we cannot always have both.

Mold Closing—Closing molds for a long period before pouring is a bad practice which is reflected in casting quality. The sand deteriorates and loses some of its properties in a closed mold, and the moisture comes back to the mold surfaces. Ideally, pour dry sand molds not later than 2 hours after they have been closed. The closer a foundry comes to this ideal, the better results it will get.

When making large cores, we time drying so that the cores are available when the molds are dried. Thus they need not be in storage, subject to damp weather or temperature changes. We have had practical proof of the effect of this practice on cleaning manhours required for ingot molds as heavy as 50,000 lb. Severe penetration resulted when the cores were not used soon enough after drying.

Pouring Practice — The manner in which large castings are poured obviously is related to the occurrence of sand inclusions. All of our castings are bottom poured. When pouring castings that require as much as 60,000 to 80,000 lb of metal, we use two stoppers with 3-in. nozzles. This practice permits us to pour colder and faster, thereby reducing the time the copes are exposed to the heat of the metal as it is poured. Overexposure to this heat causes sand to spall or drop off into the metal. We do not apply a wash to heads 30-in. or larger because we have found that sand penetrated by the wash flakes off when exposed to the heat of the metal.

With two nozzles, we can pour a ton of steel in 3½ to 4 seconds, or half the time formerly required, and our large castings tell the story in the reduction of cleaning room time. Nozzle sizes are from 1 to 3 in., and we invariably pour with the largest possible size. Slow pouring breaks down the sand and contributes immeasurably to sand inclusions. With two nozzles, one can pour with one nozzle into a gate and, when the metal pool is deep enough, open up the other nozzle into a head opening. This procedure promotes directional solidification and reduces the possibility of sand penetration at the gate since all of the metal does not pass over the same entrance area.

Tile gating is used for all large molds. One must be sure, however, that the tile does not spall when the metal passes through. A simple test to prove that the tile does not spall is to stack two or three tiles as a gate, vertically, place sand around the tile in a flask and then pour directly into the tile. Any spalling action can be seen immediately.

Cold Pouring—Because elevated temperatures increase penetration, lower pouring temperatures can improve the surface of large castings. This latitude in pouring temperature does not exist with small castings, but they also do not require the long duration which contributes to spalling in large castings.

Pouring large castings as cold as possible without producing waviness reduces penetration much quicker than any concoction of sand, although graphite and slag in the sand mixes can be of help with large castings. Alloy steel usually can be poured at a much more reduced temperature than carbon steel. The melting point of the steel should be determined in advance so that the advantages of cold pouring can be realized.

Other Points To Watch—Crushing of large molds at the parting can occur if the clamper exerts a lot of pressure on the first clamp. We usually insert wedges at the parting before clamping at the various locations. Then we clamp first on one side of mold and then the other.

Venting still is a must at high points in the mold. Many years ago all squeezer molds were vented throughout the entire cope area. Of course, in those days we did not check on permeability as we do today. Most foundries, however, use finer sand today.

One should not discount ladle linings as a source of slag or ceramic inclusions. There are many different materials on the market, and some are not able to withstand the heat of steel without spalling or erosion. When, by watching carefully, one can see foreign particles flow from the stream of metal, it is time to evaluate the ladle lining and make the necessary corrections.

Each foundry should use every possible control in its sand practices. Every control removes another phase of guesswork or another possible variable. The key to good operations then is proper supervision. The combination of alert supervision and good controls offers the best assurance of producing castings with good surfaces.

This paper was presented at the AFS California Regional Conference.

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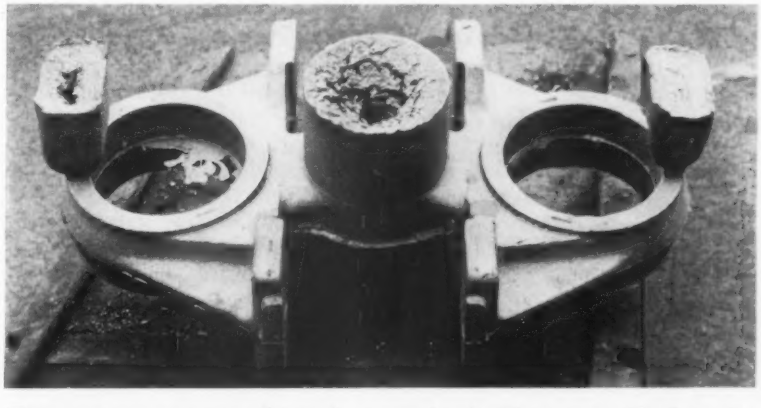
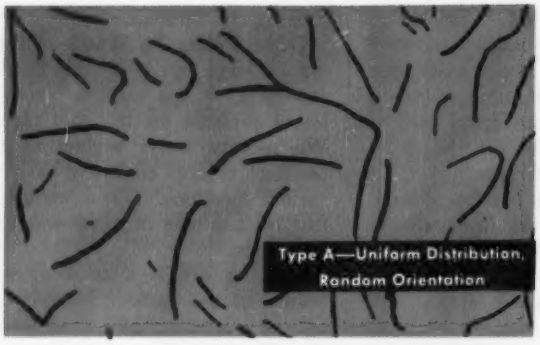
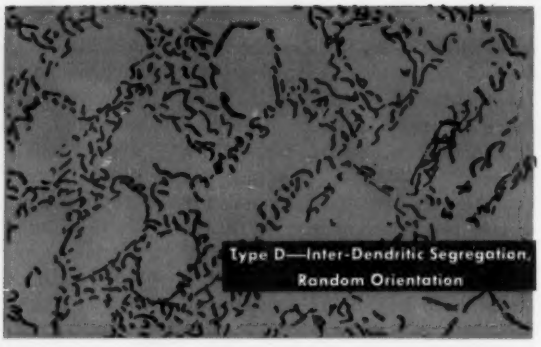


These castings were poured into the center head with no gate. Head pouring decreases the possibility of sand inclusions because the head size is so large that the ladleman can pour without touching the sides of the head





INOCULATION

Of Gray Cast Iron

The author discusses theories explaining the results of inoculation, tells why inoculants are used, and does some forecasting concerning possible uses of inoculation in the future

By RALPH A. CLARK
Metallurgical Service Dept.
Union Carbide Metals Co.
Cleveland

● INOCULATION of cast iron as we think of it today probably began in the early 1920s although use of ferrosilicon in the foundry goes back much further.

Gautier used ferrosilicon as cupola charge material as early as 1886 to make possible the use of a low-cost pig iron of low-silicon content rather than more expensive iron containing higher silicon. Geilenkirchen mentions in an article published in 1908 that Moldenke is supposed to have been the first to call attention to the deoxidizing action of ferrosilicon on cast iron.

Moldenke attributed to ferrosilicon the property of "taking up dissolved oxygen as well as other gases and floating them into the slag." In 1900, Wust mentioned the use of aluminum, sodium, and magnesium, which were plunged into the ladle.

Geilenkirchen increased this list of deoxidizers by including calcium and vanadium. He mentioned that plunging of calcium into cast iron resulted in a lowering of the carbon content and claimed a reduction in the hydrogen content of the metal. This reduction in carbon was again reported by Womochel in 1957.

A proprietary process involving inoculation with calcium-silicon appeared about this time; a patent covering the process was issued in 1922.

It was at about this time also that the influence of the metallographic structure of cast iron on the properties of the metal became generally recognized, including the fact that the amount of graphite present is a major factor in controlling the strength of the iron. Use of steel scrap to control the carbon content of cupola melted iron was coming into general use, and the introduction of the electric furnace gave the foundryman a tool which made easy the consistent production of low-carbon and hence low-graphite irons.

Effect of Graphite—The weakening influence of the graphite content of a gray iron in interrupting the continuity of the matrix is readily realized when we consider that a 2 per cent silicon pearlite has tensile strength in the range of 120,000 psi. A flake graphite iron of similar silicon and with a pearlitic matrix will probably show a tensile strength in the neighborhood of 40,000 psi. In other words, the presence of the graphite in 2 per cent silicon pearlite has lowered the strength to about one-third that of the matrix.

The great influence of the graphite is due to the fact that it has little strength in itself and even more to the fact that the shape of the graphite flakes distributed through the iron greatly interrupts the continuity of the matrix. Graphite is low in density (roughly one-third that of iron carbide). Thus some 3 per cent of graphite by weight produces a volume of graphite flakes amounting to about 10 per cent of the volume of the iron. The influence of the shape of the flakes and their distribution is illustrated

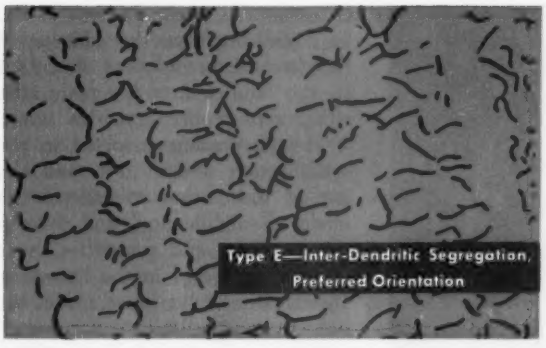


Fig. 1—Types A, D, and E graphite, taken from the ASTM Graphite Flake Type Chart

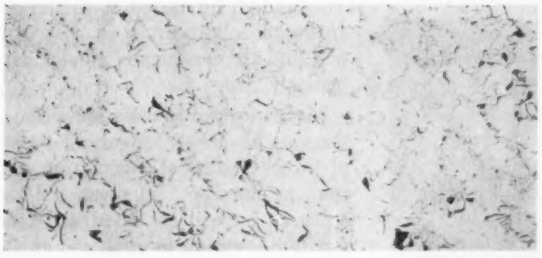


Fig. 2—Abnormal graphite distribution, Types D and E. Unetched, X100

Fig. 3—A funnel, mounted at the cupola spout, provides an inexpensive method of adding crushed alloy to molten iron

by the fact that a pearlitic ductile iron having the same amount of graphite in spheroidal form suffers relatively little damage in properties from the presence of this constituent.

With the introduction of electric furnace melting and more general realization of the weakening influence of the graphite, came an interest in the production of low-carbon cast irons (2-3 per cent carbon) in an effort to partially eliminate the influence of the graphite when making high-strength iron castings. In many cases foundrymen were disappointed in both the mechanical properties of these irons and their performance in applications involving wear and other service conditions.

Often the strength was disappointingly low and in some cases even inferior to more graphitic materials in spite of the relatively low volume of graphite in the microstructure. They tended to have poor resistance to scuffing and galling in applications involving wear, and their deep chilling properties made the production of light-section castings difficult.

Graphite Types—Microscopic examinations indicated that the graphite in such irons often occurred in the form of very fine flakes in abnormal dendritic distributions. Irons having random orientation of the graphite in the form of larger flakes (Type A) tended to have the superior properties which would be anticipated from the lower volume of graphite.

Fig. 1 showing Types A, D, and E graphite is taken from the American Society for Testing Materials Graphite Flake Type Chart. With experience it was found that abnormal graphite distribution (Types D and E) was most common in irons of low-carbon content. It was also found that heating the molten metal to a high temperature and holding it at a high temperature promoted abnormal graphite. Naturally both these conditions are likely to be associated with electric furnace melting. In cupola melting the use of very high steel charges to make low-carbon irons, and melting conditions involving excessive oxidation, tended to result in graphite of abnormal type.

Although a matrix of pearlite was expected in these low-carbon equivalent irons, a large proportion of those containing Types D and E graphite were also found to have a matrix containing large amounts of fine grain ferrite.

The presence of the fine graphite in a matrix of soft and weak ferrite apparently allows this constituent to tear or rub out in applications involving wear.

During the 1930s and early 1940s many investigators reported that the melting of an iron containing less silicon than desired in the final composition, while leaving a portion of the silicon to be added in the ladle as ferrosilicon, resulted in vastly improved properties. This was particularly true in the low-

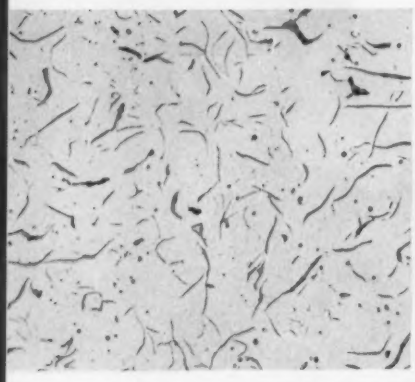


Fig. 4—Type A graphite, having random orientation and uniform distribution. Unetched, X100

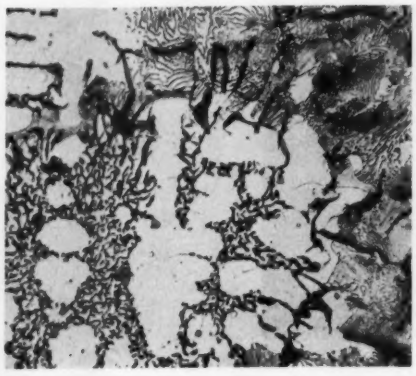


Fig. 5—Ferrite and Type D interdendritic segregation, random orientation graphite. X250

TABLE I—Effect of Late Silicon Addition on Properties of a 3.10% Carbon—2.10% Silicon Cast Iron*

Iron Number	1	2	3	4	5
Silicon in charge	2.17%	1.50%	1.00%	0.50%	.....
Silicon—late	.....	0.58%	1.15%	1.57%	2.13%
Silicon—total	2.17%	2.08%	2.15%	2.07%	2.13%
Transverse strength ...	2299 lb	2475 lb	2868 lb	2925 lb	2476 lb
Deflection	0.190 in.	0.242 in.	0.325 in.	0.335 in.	0.248 in.
Tensile strength	37150 psi	42560 psi	47550 psi	48400 psi	39475 psi
Brinell hardness	217	217	212	212	207

*Crosby and Herzig.

carbon-equivalent irons needed for high-strength castings. Incidentally, observations concerning the marked beneficial effects of ferrosilicon ladle additions on the properties of cast iron were recorded at the Union Carbide and Electro Metallurgical Co. Research Laboratories as early as 1928.

During this period the use of several addition agents became established. Ferrosilicons varying from 50-95 per cent in silicon content were used widely. The proprietary process involving the use of calcium-silicon alloy containing 32 per cent calcium and 63 per cent silicon was, of course, already established. Ferroalloy producers also developed proprietary materials such as a silicon-manganese-zirconium alloy and a calcium-silicon-titanium alloy. Leaving a portion of the silicon for ladle addition at the time of tapping as one of the above materials became known as inoculation, and the materials added in this way are commonly known as inoculants. The considerable improvement in properties resulting from inoculation of a suitable base iron is illustrated in Table 1 from Crosby and Herzig.

Definition of Inoculation—Inoculation can be defined as a process in which an addition is made to molten cast iron for the purpose of altering or modifying the microstructure of the iron and thereby improving the mechanical and physical properties to a degree not explainable on the basis of the change in composition.

Inoculation is not peculiar to the iron foundry. Similar processes are used to modify the properties of other metals.

In the case of cast iron, the increase in the silicon content of the iron resulting from the addition of the ferrosilicon or other inoculant is not sufficient to explain the changes in properties which result.

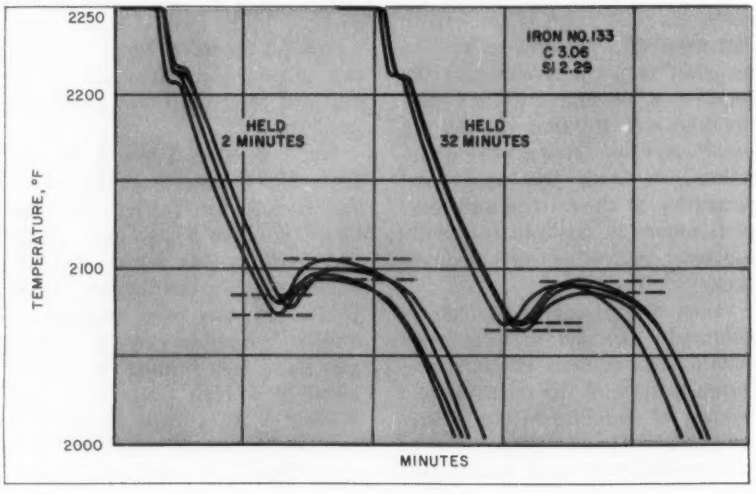
The phenomena involved in the solidification of cast iron and the use of inoculation to control the mode of solidification, and thereby the structure and properties, have been ably covered in the literature. Investigators who have made significant contributions to our knowledge of the subject include Alfred Boyles, John T. Eash, H. W. Lownie Jr., V. A. Crosby, C. O. Burgess, R. G. McElwee, and many others. The student interested in the mechanism of solidification of cast iron will find the writings of Boyles particularly instructive.

Mechanism of Inoculation—Many theories have been advanced to explain the results of inoculation and the mechanism involved. Most of them have been based on some sort of nucleation mechanism, as the term "inoculation" implies. The three most common theories are:

1. *Graphite Nuclei Theory*—According to this theory, graphite particles present in the melt act as nuclei to initiate graphitization during solidification. The fact that ladle additions of solid graphite exert an inoculating effect is taken as evidence supporting this theory. The potent effects of silicon-bearing inoculants are sometimes attributed to local concentrations of silicon in the molten iron promoting a shower of fine graphite nuclei in the melt.

The tendency of overheated irons

Fig. 6—Cooling curves indicate that inoculation minimizes undercooling. The chart is from the book *The Structure of Cast Iron* by Boyles



to solidify with Type D or Type E graphite is attributed to solution of the graphite nuclei at high temperatures, and the greater tendency of low-carbon irons to solidify with these types of graphite is attributed to a scarcity of these nuclei compared with iron of higher carbon content.

2. *Gas Theory*—Since silicon and other elements contained in the addition alloys are effective deoxidizers, it has been argued that inoculation involves reaction of the inoculant with dissolved or chemically combined gases such as oxygen, nitrogen, or hydrogen.

3. *Silicate Slime Theory* — This theory suggests that a submicroscopic slime or cloud of ferrous silicate inclusions is formed during inoculation which act as nuclei for the formation of random graphite.

These theories have many points in common and overlap to a certain extent in that they all explain the effect of inoculation as nucleation of the melt by some type of nuclei which are variously assumed to be particles of undissolved graphite, products of deoxidation or at least of degasification, or submicroscopic particles of ferrous silicate.

That inoculation does involve some type of nucleation which minimizes under-cooling appears to be amply demonstrated. (Undercooling or supercooling is defined as a phenomenon in the freezing of metals in which the metal cools several degrees below the freezing point before solidification commences.) Boyles has demonstrated that the cooling curves of an iron inoculated with calcium-silicon and held two minutes before pouring into a test specimen show that solidification of the eutectic took place at a higher temperature than that of the same iron held in the furnace an additional 30 minutes at 2700° F to allow the inoculation to wear off. These cooling curves are illustrated in Fig. 6. Effect of treatment is shown in Figs. 7 and 8.

Boyles' data indicate that there is, on the average, a difference of some 10° F between the eutectic arrest points of the iron exhibiting Type D graphite and that of the inoculated iron containing Type A graphite. While Boyles' data indicate a difference of 10° F for an iron of 3.06 per cent carbon and 2.29 per cent silicon, Eash, in somewhat similar work, found a difference of some 60-70° between the temperature of eutectic solidification of very low carbon iron analyzing approximately 1.80 per cent carbon and 2.10 per cent silicon poured into 3 in. diameter specimens.

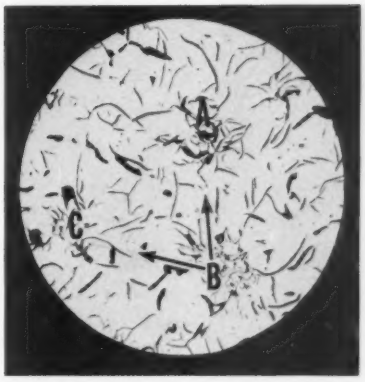


Fig. 7—Random graphite, fine cell size in an iron held in the furnace for 2 minutes following inoculation (Boyles)

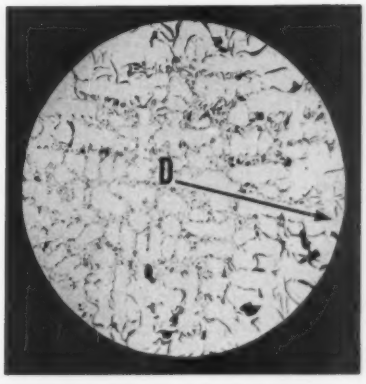


Fig. 8—Types D and E graphite in an iron held in the furnace for 32 minutes following addition of the inoculant (Boyles)

This confirms common experience that low-carbon irons not only show more tendency toward the so-called undercooled types of graphite in the as-melted condition, but also more decided improvement in properties from inoculation compared with irons having a higher carbon equivalent.

Inoculation provides nuclei to form centers of crystallization which initiate solidification and in this way minimizes undercooling. The nature of these nuclei is imperfectly understood but of their existence there can be little doubt. It will be noted that the inoculated iron in Fig. 7 contains three centers of crystallization marked A, B, and C while the uninoculated iron illustrated in Fig. 8 contains only one.

The larger number of solidification cells is typical of an effectively inoculated iron. By starting solidification at a high temperature and by providing heat of crystallization at an increased number of points, the solidification of the iron is sufficiently delayed to provide freedom of graphite growth resulting in a random graphite rather than the undercooled types.

Influencing Factors—If we assume that inoculation works by controlling the degree of undercooling, it at once becomes apparent that the rate of solidification and the analysis of the iron being treated exert an important influence on the results obtained.

High-carbon, soft irons tend to exhibit fairly random graphite distribution and neither structure nor properties are much affected by inoculation except when solidification is rapid as in thin sections. On the other hand, low-carbon irons tend to show a strong tendency toward segregation of the graphite in the Type D and E structures. Although very slow solidification may allow sufficient freedom of graphite growth to give a random graphite in very heavy sections, these irons show a strong response to inoculation when poured into castings of average section thickness.

Lownie has illustrated this in Fig. 11, in which tensile strength of a number of commercial cupola cast irons both inoculated and without inoculation are plotted against carbon equivalent. At low-carbon equivalents the inoculated irons, with few exceptions, are far superior to untreated iron of similar composition. However, as carbon equivalent approaches 4.0 there is little difference in their properties and the curves suggest that inoculation of very high carbon equivalent irons was, in fact, harmful to their properties.

The above curve is based on use of the 1.2-in. arbitration bar specimen. Use of a lighter test bar involving more rapid solidification would have pushed the point at which inoculation became ineffective nearer to the eutectic composition. Use of a heavier test speci-

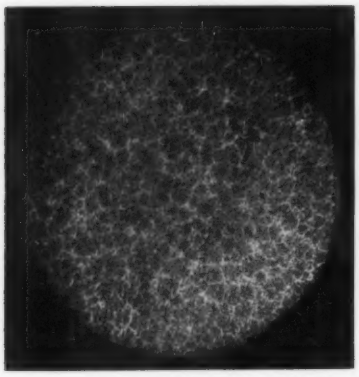


Fig. 9—A coarse eutectic cell size in uninoculated iron with composition of 3.10 per cent C and 2.00 per cent Si. X3

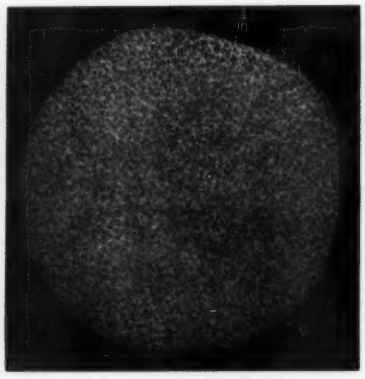


Fig. 10—A fine eutectic cell size in inoculated iron having composition of 3.10 per cent C and 2.00 per cent Si. X3

men which freezes more slowly would have indicated a somewhat lower carbon equivalent at which the inoculation was without benefit.

That the degree of undercooling during freezing of a metal is influenced by the rate at which it is cooled and solidifies is well known. Cast iron is no exception. In light-section castings the rate of solidification may be such as to cause undercooled structures when cast in an iron which would show random graphite in heavier castings. Thus it is possible for the structure of a casting to vary considerably in different locations with soft ferrite and fine graphite in the lighter sections.

Summing up, the mode of solidification and the resulting structure of a cast iron are affected by:

1. The analysis of the metal and particularly its carbon equivalent.

2. The rate of cooling and solidification of the casting as controlled by its section thickness and design.

3. Treatment of the metal during melting, including such factors as degree of superheating, and

4. Inoculation to provide nuclei for solidification and graphite growth.

Why Use Inoculants? — Inoculants are used for many reasons, depending on the needs of the individual foundry. These include:

1. Control of graphite structure in low-carbon high-strength iron. Accurate control of structure makes possible the consistent production of high properties.

2. Elimination of fine eutectiform graphite and the primary ferrite which usually accompanies this type of graphite improves service life in applications involving wear, and helps eliminate failure by scuffing or galling.

3. Reduction in the chilling characteristics of an iron resulting from inoculation permits use of low-carbon high-strength iron in light sections.

4. Small additions of inoculants are used in soft irons for chill control to prevent hard edges in light castings.

5. Variable additions of inoculants often are used as part of an effective chill testing program to correct fluctuation of the base iron resulting from minor variation in certain phases of cupola practice, or in the raw materials. Used in this way, the inoculants contribute to the production of a uniform iron.

As indicated in Table I and Fig. 12, the properties of cast irons of similar composition may vary greatly depending on the treatment during the melting process. Data by Crosby and Herzig in Table I illustrate this point. These irons all contain approximately 3.10 per cent carbon and 2 per cent silicon; yet arbitration bar properties show a variation of some 11,000 psi in tensile strength, depending on whether all the silicon was introduced into the furnace with the charge or whether a substantial portion was added to the metal as ferrosilicon when tapped.

Since ferrosilicon was the first widely used inoculant, and all later inoculants were high-silicon materials, this matter of ladle addition of ferrosilicon or other high-silicon

Fig. 11—Tensile strength versus carbon equivalent of inoculated and uninoculated iron (Lownie)

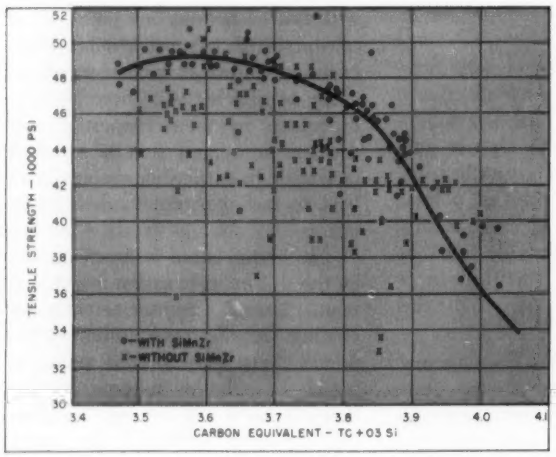
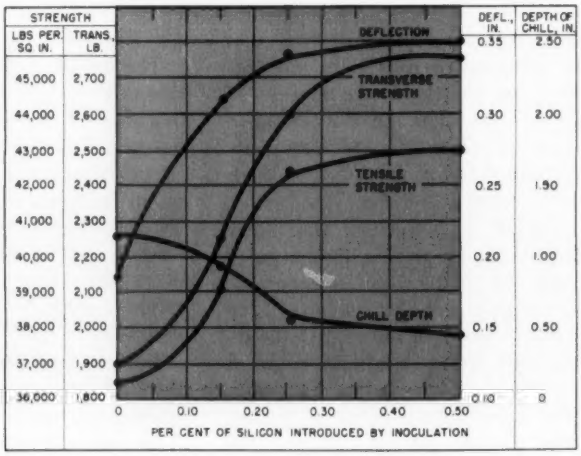


Fig. 12—Properties of gray cast iron as affected by increasing the additions of inoculant



alloys caused inoculation to be considered merely as a late addition of silicon. In fact, the literature contains many references to the fact that silicon added in the ladle has a greater graphitizing influence and more favorable influence on properties than the same amount of the element incorporated in the charge. Comments indicating that late additions of silicon are about three times as effective in eliminating chill in iron as equivalent amounts melted in the charge are common in the literature on inoculation.

It will be noted in Table II that the commonly used graphitizing inoculants with the exception of graphite have one outstanding characteristic in common—a high silicon content. It has not always been recognized that these materials also contain appreciable amounts of reactive elements such as calcium and aluminum and in some cases titanium or zirconium. In the ferrosilicons these are largely residual elements introduced from the raw materials smelted in making the alloy. In the more complex proprietary materials they are intentionally added.

The foundryman has been inclined to consider inoculation as a late silicon addition and many of the theories attempting to explain the results obtained are based on this assumption. It has been well demonstrated, however, that the presence of the reactive elements is necessary in an effective inoculant.

The data in Table III published by Womochel and his co-workers indicate ineffective inoculation from a ferrosilicon of low aluminum and calcium content. The materials used in this experiment were selected to illustrate the effect of extremes of active metal content, and the high-aluminum ferrosilicon contains a higher level of this element than is produced in normal commercial practice. However, they indicate that foundrymen using ferrosilicon as an inoculant are well advised to purchase this material from producers who control the level of these elements within a relatively narrow range in the interest of improved uniformity in use.

That inoculation is more than a simple addition of silicon is indicated by the fact that addition of refined silicon metal or ferrosilicon of very low aluminum and calcium

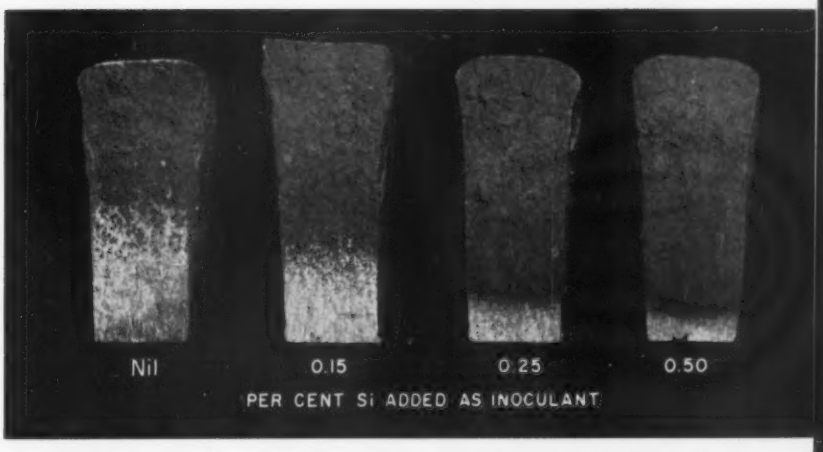


Fig. 13—Increasing additions of inoculant reduce chill depth. Analysis of the iron following inoculation was 3.10 per cent C, 1.80 per cent Si

TABLE II—Typical Composition of Commonly Used Inoculants

	Silicon	Aluminum	Calcium		
50% Ferrosilicon*	49%	1.00%	0.1%		
75% Ferrosilicon*	75%	1-2%	0.4%		
85% Ferrosilicon*	85%	1-2%	0.5%		
90% Ferrosilicon*	93%	1-2%	0.5%		
Calcium-Silicon	63%	1%	32%		
Silicon-Manganese-Zirconium (SMZ)	63%	1.7%	2.5%	6% Mn	6% Zr
Calcium-Titanium-Silicon (Graphidox)	50%	1.3%	6%	10% Ti	
Nickel-Silicon (Nistiloy)	30%	....	2%	69% Ni	
Ferrosilicon-Chrome	30%	....	....	52% Cr	
Silicon-Manganese-Chrome (V-5)	18%	0.2%	1%	40% Cr	10% Mn

*Aluminum and calcium will vary among suppliers. These alloys are also available in low-aluminum grades containing about 0.35% aluminum. Calcium-bearing grades containing about 0.75% calcium are available in both regular and low-aluminum alloy.

TABLE III—Transverse Properties, 2.80% Carbon—2.35% Silicon Iron Inoculated with 0.5% Silicon Added as High and Low Aluminum Ferrosilicon*

Inoculant	Trans., lb	Deflec., in.	Rec., lb	Chill, 1/32 in.
Low-aluminum ferrosilicon	2591	0.220	296	12-20
High-aluminum ferrosilicon	2920	0.280	400	8-15
Not inoculated	2490	0.232	280	12-20
High-aluminum ferrosilicon	2919	0.288	430	8-14

COMPOSITION OF INOCULANTS

Low-Aluminum Ferrosilicon	High-Aluminum Ferrosilicon
93.00% Silicon	90.57% Silicon
0.45% Aluminum	2.20% Aluminum
0.01% Calcium	0.46% Calcium

*McClure, Khan, McGrady, and Womochel.

content does not yield an effective inoculation. Removal of aluminum and calcium from the ferrosilicon is a relatively simple matter and widely practiced in making of alloys for certain applications, but such low impurity or low residual ferrosilicons are not effective inoculants in cast iron. While pure silicon has little inoculation effect, it has been demonstrated by Womochel that plunging of calcium metal results in very effective inoculation.

It thus appears that one of the main functions of the silicon in the inoculant is to act as a carrier for one or more of the reactive elements. The fact that all the proprietary inoculants contain appreciable amounts of these elements, which are introduced at extra cost, indicates that this fact was recognized when most of these materials were developed some 20 years ago.

Stabilizing Inoculants—It will be noted that some of the materials listed in Table II contain large amounts of nickel or chromium. These materials are used to obtain a simultaneous alloying and inoculating effect. In the case of the nickel-silicon alloy, the graphitizing effect of the nickel is combined with an inoculating effect on graphite structure. The chromium-bearing alloys, commonly called stabilizing inoculants, combine the stabilizing effect of chromium on the matrix

structure with a desirable distribution of graphite. They are so balanced for composition as to permit substantial additions of chromium without altering the chilling characteristics of the iron.

Method of Use—Inoculants usually are added to the iron as the ladle is being filled. This is best accomplished at the cupola spout where the metal temperature is highest, although, when necessary, treatment can be carried out during transfer from one ladle to another on the foundry floor. The coarser sizes (½ in. x 12 mesh or ½ in. x down) may be used for addition to large ladles while 8 mesh by down or 12 mesh by 32 mesh material is best for addition to 500-pound or smaller ladles, or for mechanical feeding. We do not consider the use of very fine ferrosilicon or other inoculant advisable, since such fine material is not wet readily by the iron and tends to float rather than dissolve.

The best procedure is to add slowly the alloy to the metal flowing down the cupola spout to the ladle. In many shops this is done by using a vibratory or other mechanical feeder. It can also be accomplished by adding the alloy through a funnel placed above the spout. Under some circumstances, particularly where a receiving ladle is used, the alloy must be added directly to the ladle. In such cases the material should be poured slowly into the base of the stream where the metal is most turbulent. A small container fitted with a long handle is convenient for adding an inoculant directly to the ladle.

The amount of molten iron into which the inoculant is added should be either weighed or estimated carefully by volume. While it is good practice to weigh the alloy addition, it can be estimated fairly accurately by volume. A good solid container should be used for this purpose. The use of a battered tin can may result in considerable variation in the amount of material added. It is also poor practice to throw alloy into a hot ladle where it may sinter to the bottom. These suggestions appear superfluous but under actual shop conditions we often find an alloy addition being made carelessly enough to result in either considerable waste or poor control of the process.

Future of Inoculation—The properties of cast iron are affected more by the cooling rate from the solidification temperature than are those of any other metal. Iron cast from the same ladle may produce a white cast iron, a casting with a chilled unmachinable edge, a strong close-grained structure or a weak open structure, depending on the section of the casting into which it has been poured.

While the founder of other metals can use the same metal in castings of widely varying weight, the iron foundryman is not so lucky. He usually faces the problem of making a suitable metal for a wide variety of castings to be poured from a single cupola heat. This may not bother foundries employing a batch-melting process, but the combination of cupola melting and mechanized molding found in most of today's iron foundries makes usual some degree of compromise in metal quality.

This is not a simple problem to solve but we believe many foundrymen tend to overlook the possible advantages of melting a metal of low silicon content which can be easily modified by ladle addition of an inoculant to fit the needs of the individual casting.

Our feeling is that such a practice appears more logical than the melting of a single iron of intermediate hardness which is necessarily a compromise in composition for a large share of the castings produced. Although the practice of inoculating a low-silicon iron is not new, we believe it has many advantages and will find increased use as the demand for more accurate metallurgical control develops.

While inoculation was developed originally as a part of the melting practice for producing low-carbon high-strength irons, this traditional use does not constitute the heaviest use of the inoculating alloys. A greater tonnage, by far, is added to the softer high-carbon irons commonly used in castings in which strength is of lesser importance. In such cases the inoculant is employed primarily to control the chilling characteristics of the iron and to promote consistent machinability, a property which today's automatic high-speed machine shops are making ever more important.

It is obvious that inoculation is no cure-all. Ladle additions to metal of unpredictable composition resulting from poorly controlled cupola practices should not be expected to produce high-grade iron of controlled properties. We believe, however, that inoculation is a time-proven tool which the iron foundryman can make a useful part of his melting practice. We also believe this process will find increased use as the demands for higher metallurgical quality on the part of the foundry industry's customers become more stringent.

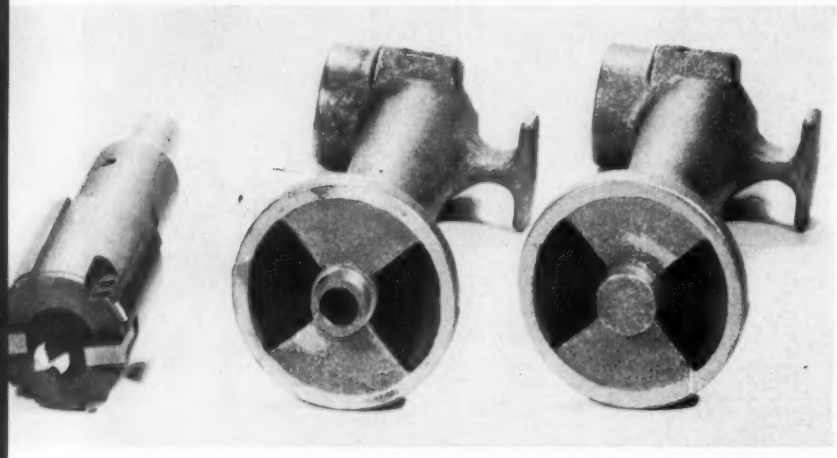


Fig. 14—Small additions of inoculant prevent chilled corners and improve machinability in light sectioned castings such as these

Editor's Note: This article is based on a paper presented at the Metals Casting Conference, Purdue University, October, 1958.

● For an extra copy of this article, until supply is exhausted, use card on Page 53

Technical Discussions Highlight

Castings Congress

CHARLES E. NELSON
President

NORMAN J. DUNBECK
Vice President

● CONTINUED technical progress in the foundry industry was in evidence at the 63rd Castings Congress and 2nd Engineered Castings Show of the American Foundrymen's Society.

The society's annual national gathering, held in Chicago, April 13-17, had an announced registration of 4817.

Improvements in casting practice were indicated in many of the papers presented at technical sessions, and fruits of modern techniques were demonstrated in the exhibits of a wide variety of ferrous and nonferrous castings. The fact that the meeting was held in a period of rising demand for castings also lent an optimistic note to the outlook for further progress in technology and production in the foundry industry.

Annual Business Meeting—President Lewis H. Durdin, national AFS president, reviewed recent activities of the society in his presidential address. He reported that society membership now totals 12,500 and that there are 60 chapters, including 13 student chapters. A new student chapter recently was established at Wentworth Institute in Boston.

Technical activities of the society are carried on by ten divisions and nine general-interest committees. The society's *Buyers Directory*, to be published this fall, he reported,

Presidential address is given at the annual AFS business meeting by retiring president L. H. Durdin

will include listings of 11,000 products sold by 1200 firms.

Considerable interest has been shown in the program of the Training & Research Institute, and it is planned to conduct one course each year in each of the seven AFS regions. A building committee is proceeding with plans for construction of the new T & R I building in Des Plaines, Ill. It is expected to be completed in about two years.

Officers and Directors—In the annual election of officers, Charles E. Nelson, technical director, Magnesium Dept., the Dow Chemical Co., Midland, Mich., was named to succeed Mr. Durdin as president. Graduated from Alma College, Alma, Mich., in 1928, Mr. Nelson joined Dow in 1930 as a research chemist. Prior to being named technical director he was, successively, research metallurgist and assistant director of the metallurgical laboratories.

Norman J. Dunbeck, vice president, International Minerals & Chemical Corp., Skokie, Ill., is the new vice president. Mr. Dunbeck was graduated from the Catholic University of America in 1924 and joined Eastern Clay Products Inc. in 1926 as plant superintendent. He was vice president of that organization in 1951 when it was acquired by International Minerals & Chemical Corp.

Newly elected directors for three-year terms include the following:

Norman N. Amrhein, president, Federal Malleable Co., West Allis, Wis. He attended Marquette University and joined Federal Malleable in 1940 as junior engineer.

Registration headquarters at the Sherman Hotel in Chicago. Announced attendance at the Congress and Show totaled 4817

He advanced through various positions in that company to his present office.

Robert E. Mittlestead, metallurgist, Lectromelt Casting Div., Akron Standard Mold Co., Barberton, Ohio. He joined that company in 1938 following studies at Case Institute of Technology and Akron University.

A. J. Moore, executive vice president, Canadian Bronze Co. Ltd., Montreal, Que. Graduated from the University of Manitoba, Mr. Moore served with Vanadium Alloys Steel Ltd., Montreal, prior to joining Canadian Bronze in 1956 in his present capacity.

William H. Oliver, manager, Bond Plant, American Radiator & Standard Sanitary Corp., Buffalo. A 1933 graduate of Yale University, Mr. Oliver's foundry career began in 1948 when he joined his present company as general superintendent.

James N. Wessel, supervisory materials engineer, Puget Sound Naval Shipyard, Bremerton, Wash. Graduated from Michigan College of Mining and Technology in 1933, Mr. Wessel joined Campbell, Wyant & Cannon Foundry Co., Muskegon Heights, Mich. In 1939 he went to Mare Island Naval Shipyard, Vallejo, Calif., as assistant metallurgist, moving to Puget Sound in 1940.

Donald L. Colwell, vice president, Apex Smelting Co., Cleveland, was elected a director-at-large to serve for three years. A graduate of the University of Chicago, Mr. Colwell has been identified with the metal castings field since completion of two years of service in the U. S. Army in 1917-19. Prior to joining Apex, he was associated with the Stewart Die Casting Div. and Paragon Die Castings.

Louis J. Pedicini, manager of manufacturing engineering, Congress Die Casting Div., Tann Corp., Detroit. Graduated from Wayne State University, Mr. Pedicini joined General Motors Corp. in 1948. He was staff engineer in charge of the metal casting department there when he left last year to join Congress Die Casting. Mr. Pedicini is newly elected chairman of the AFS Sand Division.

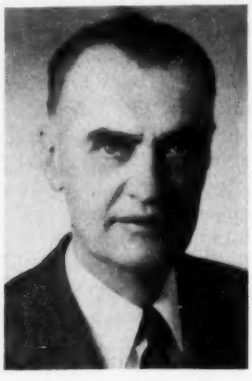
Apprentice Awards—Entries in the 1959 Robert E. Kennedy Memorial Apprentice Contest totaled 474 from 189 companies. Fifteen AFS chapters conducted contests, winners of which were entered in the national competition. First and second place winners in the five classes of competition were present to receive their awards from President Durdin. Top three winners in the divisions were as follows:

Wood Patternmaking—Horst N. Prohaska, Caterpillar Tractor Co.,

Harry M. St. John delivering the annual Charles Edgar Hoyt Lecture

New AFS Directors

NORMAN N. AMRHEIN



DONALD L. COLWELL

ROBERT E. MITTLESTEAD

Peoria, Ill.; Darrell A. Giles, Beaver Pattern Co., Detroit; Ray Bunk, Rupp Pattern Co., Rockford, Ill.

Metal Patternmaking—Louis S. Uveges, Ford Motor Co., Berea, Ohio; Zane Holowachuk, International Harvester Co., Hamilton, Ont.; S. Gregory Monoc, Ford Motor Co., Berea, Ohio.

Iron Molding—Forrest R. Wills, Link-Belt Co., Olney Foundry, Philadelphia; Alfred A. Di Raimo, Brown & Sharpe Mfg. Co., Providence, R. I.; William Gregory, W. O. Larson Foundry Co., Grafton, Ohio.

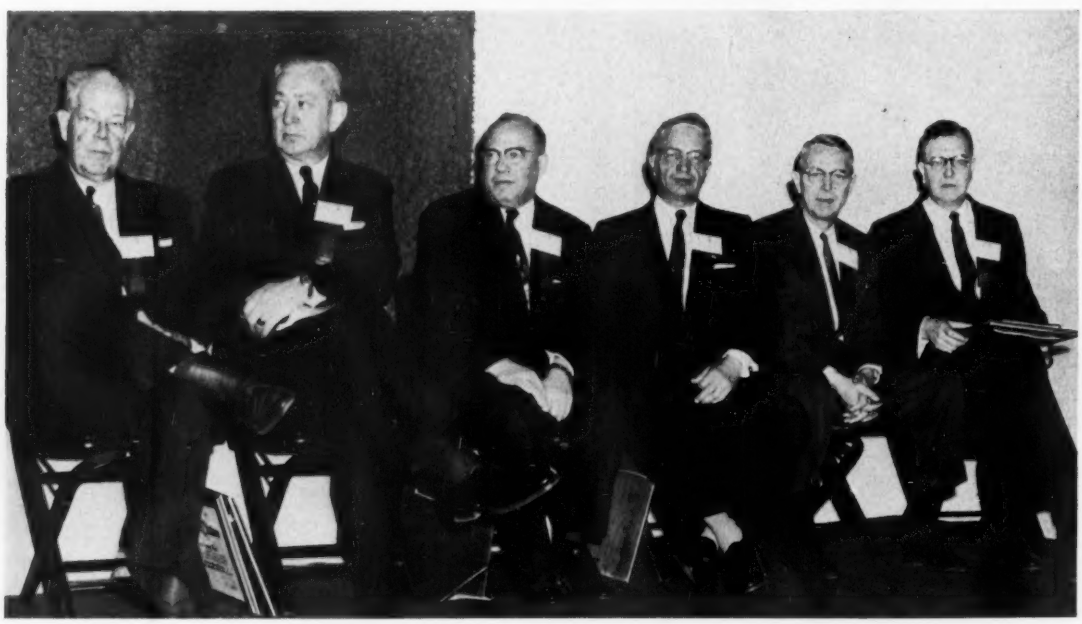
Steel Molding—Robert Lord, Dominion Engineering Works, Montreal, Que.; Atlas Foundry & Machine Co., Tacoma, Wash.; James Rogers, Oregon Steel Foundry Co., Portland, Oreg.

Nonferrous Molding — Stanley Graff, Eck Foundries Inc., Manitowoc, Wis.; Ronald McConville, Nordberg Mfg. Co., Milwaukee; Ralph Leland, Alloy Aluminum Foundry Co., Los Angeles.

Citations and Awards—Six men were honored at the meeting in the presentation of Service Citations and Awards of Scientific Merit. The presentations were made by Walter L. Seelbach, chairman, Board of Awards, and president, Superior Foundry Inc., Cleveland.

Service Citations went to James R. Allan, foundry consultant, Melbourne, Fla.; Bernard D. Claffey, vice president, Dayton Malleable Iron Co., Dayton, Ohio; Roy W. Schroeder, associate professor, Navy

Recipients of awards and citations at the business meeting were, left to right, James R. Allan, B. D. Claffey, Roy W. Schroeder, Robert H. Mooney, Howard H. Wilder, and Elmer C. Zirzow



A. J. MOORE

WILLIAM H. OLIVER

LOUIS J. PEDICINI

JAMES N. WESSEL

Pier Branch, University of Illinois, Chicago.

Awards of Scientific Merit were made to Robert H. Mooney, works engineer, Central Foundry Div., General Motors Corp., Saginaw, Mich.; Howard H. Wilder, manager, engineering sales, Vanadium Corp. of America, Chicago; Elmer C. Zirzow, director of foundry service, Werner G. Smith Inc., Cleveland.

Hoyt Lecture—Immediately following the annual meeting, the Charles Edgar Hoyt Memorial Lecture was presented by Harry M. St. John, former superintendent of nonferrous foundries, Crane Co., Chicago, and currently a foundry consultant. This lecture, entitled "The Control of Quality in the Brass Foundry," consisted of a comprehensive but concise discussion of the various factors which affect the quality of brass and bronze castings.

Apprentice contest winners. Standing (first-place winners): Horst N. Prohaska, Stanley J. Graff, Forrest R. Wills, Louis S. Uveges, Robert Lord. Seated (second-place winners): Darrell A. Giles, Ronald McConville, Alfred A. Di Raimo, Zane Holowachuk, and James Fazio

Main subjects covered included specifications, inspection, scrap study, metal quality, temperature control, scrap records, molding practice, cores, statistical quality control, gating, and casting design.

If scrap is to be kept at a minimum, he said, the following conditions must be observed: 1. Quality of the metal must be good. 2. Design of the casting must be good. 3. The casting must be well gated. 4. Pouring temperature range must be known. 5. Pouring temperature must be measured and kept within the known range. 6. Do not pour more molds from one ladle than variations in the foregoing requirements permit.

Annual Banquet—Mr. Durdin presided at the annual banquet in the Terrace Casino of the Morrison Hotel. Walter L. Seelbach, chairman of the Board of Awards, presented the John H. Whiting Gold Medal to Harold W. Lownie Jr., Battelle Memorial Institute, Columbus, Ohio; the Peter L. Simpson Gold Medal to John A. Rassenfoss, American Steel Foundries, East Chicago, Ind.; and the John A. Penton Gold Medal to Fred J. Walls, Engineering Castings Inc., Marshall, Mich.

Warren Whitney, vice president, James B. Clow & Sons and general manager of its National Works, Birmingham, treated his audience with an interesting talk on "Solutions of Problems that Don't Exist."

Reports on technical meetings during the Congress start on p. 181.

Exceptional Quality Keynotes Displays at

Engineered Castings Show

● THE SECOND Engineered Castings Show, held in Chicago April 13-17 under AFS auspices, brought together the most interesting and diversified collection of fine castings ever collected in one place. Those attending the show were impressed by the fact that castings, in a multiplicity of complicated shapes, provide the most modern and reliable forms of engineering components.

Practically every type of metal alloy was represented, including brass and bronze, aluminum, magnesium, gray iron, and steel. Special alloys for particular applications were much in evidence. Likewise, castings made in every type of molding medium were on display, including sand, permanent mold, investment, ceramic molds, shell molds, shell coat, and die castings. The developments that have taken place in casting steel in shell molds were a feature of the show. In fact, progress in the foundry industry in recent years was reflected in the excellence and the diversity of the castings shown.

In addition to featuring production processes, foundrymen maintaining exhibits stressed the many important advantages of castings, such as ability to produce complicated shapes, high physical properties, surface finish, dimensional accuracy including close tolerances on critical surfaces, corrosion resistance, wear resistance, weight reduction, cost savings, reduction or elimination of machining, and numerous others.

Castings on display covered an exceptionally wide field of applications. To some, special interest centered in castings used in the production of aircraft and missiles. The fields are relatively new to the foundry industry, but attention given by some producers suggested an expected enlargement of demand.

Probably the greatest application of castings shown was in the field of transportation. A wide variety of cast parts for automobiles, trucks, tractors and trailers, railroads, and tanks provided interest for the show visitors.

End uses for some of the other castings shown include radar trunnions, dies, furnace charging door frames, cupola tuyeres, electrode holders, portable tools, business machines, impellers, gears, cylinder blocks, jacks, manifolds, pistons, exchangers, valves, conveyors, pulleys, housings, flanges, liners, crankshafts, transmission housings, and compressors.

Surely the engineers, designers, and buyers attending the show could not help but be impressed by the ability of the foundry industry to provide dependable products of high and uniform quality for practically every type of engineering construction.

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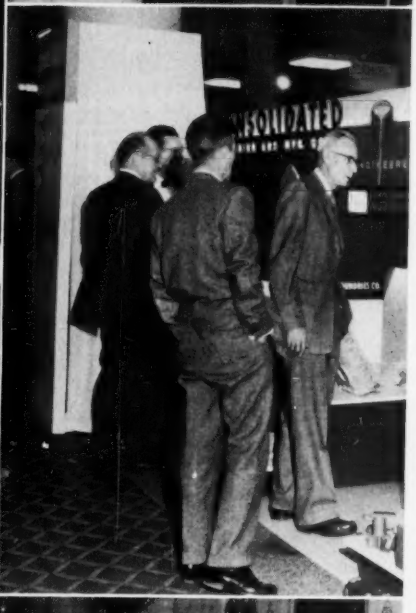

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Questions and Answers

Correct melting procedure will eliminate porosity problem with aluminum . . . Precautions must be taken when chills are used . . . Castings are too hard . . . Tightness will be lacking . . . Cupola emissions . . . Sand mixtures

Porosity Occurs Under Skin

We have been trying to make pressure-cast matchplates in plaster molds and are having difficulty with porosity under the skin of the castings. Are there any books or literature on the subject which would be of help in overcoming that problem?

Various articles have been published on the making of pressure-cast matchplates, but your problem is something other than one of production of molds. Apparently your molds are dried thoroughly since you do not mention rough surfaces, blowholes, etc. Your problem of porosity under the skin indicates that the aluminum alloy has absorbed gas during melting, or possibly has entrained air during pouring.

We doubt that it is due to entrained air if you are following the usual practice of using an insulated metal reservoir sealed with an asbestos disk and situated over the pouring sprue. The reservoir is filled with molten metal which is allowed to cool to about 1130° F, and then a few pounds of air pressure is applied. That pressure ruptures the disk and forces the metal into the mold. Amount of metal in the reservoir should be slightly in excess of the quantity needed to fill the mold cavity and sprue, else air may be entrained.

While the practice of filling the reservoir with molten metal and allowing it to stand quietly for a short time helps to permit absorbed gases to escape, it does not function perfectly. Hence, the aluminum should be melted under conditions which minimize gas pickup. Use clean, dry metal and melt it in clean crucibles. Melt rapidly and pull the crucible as soon as it is up to temperature. A temperature of 1250° F should be sufficient to permit skimming and handling to the mold side. In addition, the alloy may be treated with either solid or gaseous degasifying fluxes.

Chilling of Bronze Gears

Can you supply any information on chilled bronze gears relative to the type of chill used, material for the chill, and how it is handled? Is the chill smoked or coated, and is it heated?

Bronze gears are cast in chills to obtain a denser structure. Sand-cast high-tin bronzes rarely are free from interdendritic porosity when subjected to the extensive machining required in forming the gears. Several techniques are used for gear blanks, and while none appears completely satisfactory, results seem to be acceptable to gear consumers.

In general, cast iron chills are satisfactory, and usually sectional chills completely enclose the exterior circumference. Those chills increase the depth of the dense casting skin, and move the interdendritic porosity back to a point where it is not encountered in machining. The chills usually are rammed up in the mold and heated by a torch prior to filling the cavity with molten metal. Pouring against a cold chill tends toward blowing.

The chill generally is heated to a temperature greater than that required, just to make sure it is dry. That is done to control the chill action since the hotter the chill the less drastic its action, and the most suitable temperature is determined by experiment.

In some cases the chills are smoked and in others various coatings are used. The problem is one of preventing blowing, and there is no general agreement on the most satisfactory method. Coatings should be thin since heavy coatings form an insulation and reduce the chilling power. When using chills the gating should be such that metals flow to but not over the chills.

Brinell Hardness Too High

We are shell molding some gray iron cylindrical castings 9 in. long, 4 in. OD, and ¾ in. ID weighing 25 lb. Iron contains 1.90 to 2.00 per cent Si, 0.40 to 0.50 per cent Mn, 0.60 to 0.70 per cent P, and 0.08 to 0.100 per cent S. Specification calls for a brinell hardness range of 175 to 185, but the trouble is that the castings range from 200 to 230. However, by bedding them down in sand immediately after shakeout when they are bright red, and leaving them for 15 hours, they come within the specification on hardness. To eliminate that operation can you tell us at what temperature we can shake out without running into surface chill?

Apparently the temperature of your castings at shakeout is in the critical range. Use of color as a temperature indication is far from exact since it depends not only on color perception of the observer but on the brightness of the surroundings in which the observation is made. Color charts indicate that the temperature range of cherry red to bright cherry red is 1380 to 1500° F, and that would be in the critical temperature range for your iron.

While shaking out the castings at no hotter than a dark red would eliminate any tendency to surface chill, we believe that you will have to make some change in composition to come within the desired hardness range. Even then you may have some difficulty since the limits are rather close. Increase of silicon and carbon in your present mixture or addition of graphitizing agents

to the molten iron poured into the cylinders will result in an iron with a lower brinell hardness. You will have to determine the method and experiment to make the required adjustments.

Inserts Will Not Be Tight

We have an order for some steel castings ⅝ in. thick which are to contain ⅝ x ⅝ x ⅝-in. tool steel inserts which we would like to cast in place. Inserts must be removable by hydraulic pressing for replacement when they wear out. Can you suggest coatings which will prevent fusion of the inserts?

It is extremely doubtful that the idea of casting-in the tool steel inserts will give the results anticipated. When the molten steel comes in contact with the inserts, they will expand to some degree and the steel will solidify around the enlarged inserts. When the two parts cool, the contraction will not be the same so that the inserts will not be held tightly in position.

If a coating is placed on the inserts to prevent fusion, the presence of that material will prevent a tight fit. For coating material, any of the core or mold washes you use should serve. Unless considerable molten metal flows over the inserts, however, we do not believe you will have trouble with fusion.

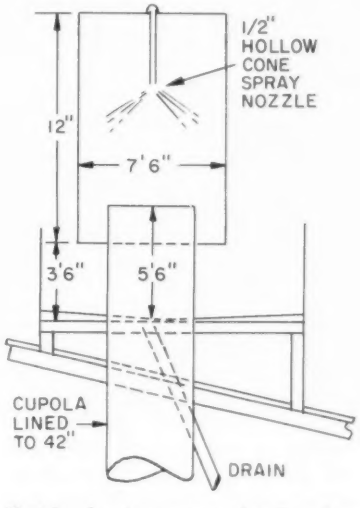
To obtain a tight fit of the inserts in the steel casting we believe that it will be advisable to core out the holes slightly smaller than the inserts and broach them to press-fit dimensions. With suitable press or punch equipment, it would be possible to punch the holes from the solid.

Control of Cupola Emission

For about 35 years we have operated a hard iron foundry in this small community and during that time have worn out 6 or 8 cupolas. Now we are preparing to install a No. 7 cupola. Since we are right in the middle of the town, the dirt that blows out of our cupola stack is very objectionable. We melt about 60 tons every other day—motor blocks, stove iron, etc.—and when the wind is in the southwest, gas, grit and dust are poured out all over the main street and residential area. People have been very nice about this situation, but when we install the new cupola, we certainly would like to know how we can control the debris which goes with every heat poured.

A simple arrangement which is reported to collect 50 to 60 per cent of the particles emitted from the cupola stack is shown in the accompanying illustration. As indicated it employs a cone-shaped water spray to knock down the particles, and was designed some years ago for a cupola lined to 42 in. In your case with a cupola lined to around 54 in., some changes in dimensions would be required since the volume of gases to be handled would be much greater, and probably more water would have to be used to be sure that the water curtain is sufficient to cool the gases and knock down the particles.

Other simple types employ a sheet metal cone in the top of the



Sketch showing some details of a spray emission control

enclosure over which water flows to form a curtain through which the gases must flow before reaching the atmosphere. Sometimes the cone and the water cone nozzle are combined. While this brief discussion makes it appear that construction and operation are easy, some engineering problems are involved, and we suggest that you obtain information from any of the manufacturers of such equipment. Their names and addresses may be found in the advertising section of FOUNDRY.

Sand Mixture for Blowing

Can you give us any suggestions on a sand mixture which can be used in a coreblowing machine and result in cores which are strong enough to be picked up and placed in a tray for baking?

Some green sand cores are blown on arbors which can be picked from the boxes by the arbors and placed in the molds, and if the cores you have in mind lend themselves to that practice it might be tried. Another practice is to have the lower half of the corebox form the dryer on which the core is baked.

As a direct answer to your question, we believe that a core mixture strong enough in itself to be handled either could not be blown or, if it could, the cores would be difficult to bake and be so hard that they would be difficult to remove from the castings, not to mention that they would cause blows.

It appears to us that suitable procedures which would result in rapid core production would be use of either the CO_2 or resin-sand process. In the first method the cores are blown into the box, gassed with CO_2 for a few seconds, and then are ready for use. In the other, the resin-sand mix is blown into a hot corebox, and after curing for a brief time the core can be used.

Top Diameter Is Too Small

Having need for more melting capacity, we found that we could dismantle the lower section of our 36-in. OD cupola below the charging floor and replace it with a 50-in. OD section without shutting down the foundry. We did that and found that melting capacity increased considerably to 3 to 4 tons per hour. Now we are wondering if by enlarging the top section we can increase the melting capacity further. Lower section of the cupola is lined with 6-in. brick and the upper with 4-in. brick.

Although increasing the diameter of the upper section of the cupola will have no effect on the melting capacity, that should be done from the viewpoint of health and safety. Difference in diameters of the top and bottom sections amounts to about a 45 per cent reduction in cross-sectional area. Consequently,

there is a good likelihood of expulsion of gases through the charging door onto the charging floor, thereby constituting a dangerous health hazard.

As to melting rate of the present installation, we would expect it to be about 4½ tons per hour with an iron-to-coke ratio of 8:1. Without knowledge of your practice we can only offer suggestions which might bring about the indicated rate. Bed height should be 40 to 46 in. above the tops of the tuyeres, and the most suitable height is determined by experiment. Coke charges should be 100 lb and the iron charges 800 lb. With a melting rate of 4½ tons per hour, the air volume supplied should be about 2550 cu ft per minute.

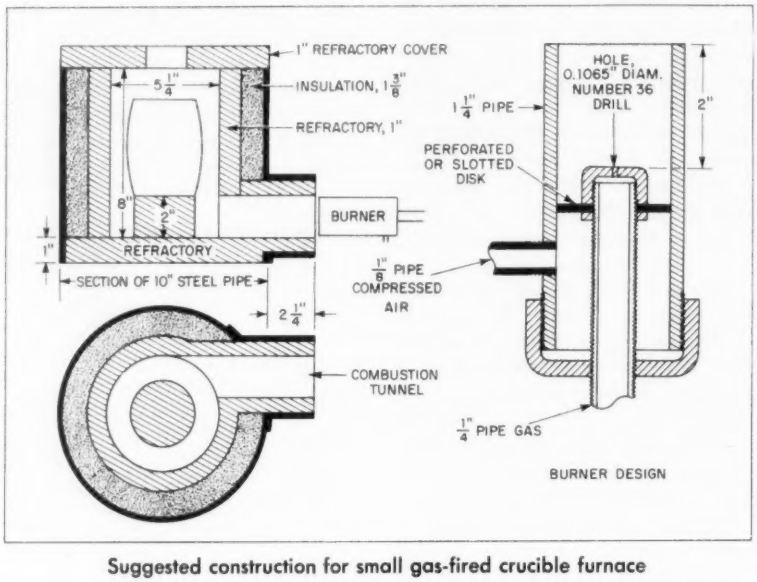
Wants Small Crucible Furnace

Your help in supplying information on the construction of a small gas-fired crucible type melting furnace to handle a No. 2 graphite crucible will be appreciated. What materials will be needed and where should the flame be positioned? What gas-air ratio is needed to attain the required flame temperature for brass melting? Are there any drawings available on such a furnace? We realize the availability of small induction type furnaces, but we want to approximate as closely as possible the type of furnaces used in the foundry, except on a smaller scale. What type and size of pyrometer would be suitable?

While we do not have definite information, we believe that you probably can purchase a furnace small enough for your purpose—such as the type known as assay furnaces used in the mining field. We do not recall any description except that given some years ago by Eggleston for a somewhat larger furnace to handle a No. 5 crucible. From that information, we have designed the unit shown in the accompanying illustration.

Shell of the furnace is a section of 10 in. steel pipe, 9 in. long, but it may be made of heavy sheet steel. Section for the combustion tunnel at the lower portion is formed of a piece of 4-in. pipe, but again it may be heavy sheet steel. We have included a lining of insulating material between shell and the refractory lining to aid in conserving heat as well as to confine the heat to the furnace interior. Thicknesses of insulating and refractory linings perhaps need be only ¾ in. each, but they are given as indicated since they fit into the pipe diameter.

A No. 2 crucible is 3 11/16 in. at the bilge, 2⅞ in. at the bottom, and 4½ in. high. Inside diameter of the furnace is 5¼ in. to allow only about ¾ in. between lining and crucible, and that dimension should be held. Refractory can be any suitable material which can be rammed into place to form a monolithic lining since it is doubtful whether a cylindrical lining of the desired size is available.



Suggested construction for small gas-fired crucible furnace

Combustion tunnel is 2 in. in diam and about 6 in. long from the outside to the pedestal on which the crucible is placed. As indicated, it is placed tangentially so that the flame strikes the furnace wall and the edge of the pedestal, and then spins upward around the crucible. Purpose of the combustion tunnel is to insure that complete combustion occurs before the flame enters the furnace proper so that all available heat is projected into the furnace. It might be worthwhile to experiment with the length of the tunnel to determine the most suitable length.

It is best to purchase a burner and save the time of experimental work. However, if you have the do-it-yourself urge you might try making a burner similar to that shown in the sketch. It is constructed of sections of steel pipe and caps as indicated. Although we are not burner designers, we have taken some of the data given by Eggleston, and came up with the ideas incorporated in the sketch.

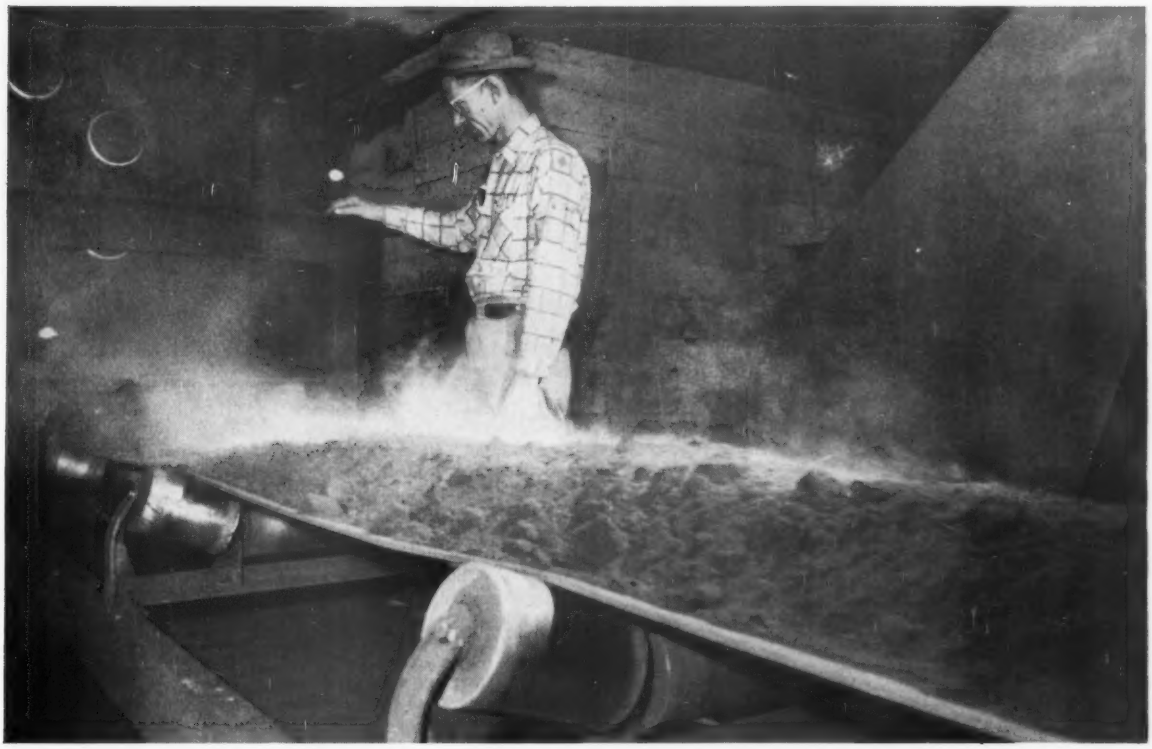
In the somewhat larger furnace, Eggleston showed that 26 cu ft of natural gas was required to bring the furnace temperature up to 2200° F, and the time was 37 minutes. That condition indicates a fuel consumption of about 42 cu ft per hour; the hole size 0.1065 in. in diameter drilled with a No. 36 drill will supply that amount of gas. Possibly it might be advisable to increase the size to supply 50 cu ft per hour which can be accomplished with a hole size of 0.1160 in. in diam using a No. 32 drill.

The larger pipe enclosure which extends beyond the gas orifice is to permit intimate mixing of the air and gas prior to ignition, and the perforated or slotted disk is to promote better distribution of the compressed air into the pipe.

Again some experimentation might be in order for the most suitable results. For example, as indicated previously, the orifice hole might be enlarged to supply more fuel, or the enclosure pipe might be increased or shortened in length, or made smaller in diameter. As to the amount of air required, available information indicates that 9.5 cu ft of air is needed stoichometrically for each cu ft of natural gas, but in practice a slight excess is used.

FOUNDRYGIANT CONVEYOR BELT

Tramp Iron can't go on a TEAR on this belt!



Hot foundry sand loaded with jagged pieces of tramp iron is a murderous combination for a conveyor belt.

That's why this leading Southern foundry uses U. S. FoundryGiant *RipStop* Conveyor Belts. These special heat-resistant belts have rip-stopping wire ribs imbedded in the carcass across the belt at 3' intervals to prevent the jagged pieces of metal flash, sprues, gates, geigers, etc., from going on a tear and wrecking the belt. Where previous belts lasted only 2 or 3 months, the "U. S." belts are lasting 8 times as long!

Two FoundryGiant cotton-nylon belts convey the tramp-infested hot sand from both the shakeout and sand-slinging unit to storage bins. These thinner belts, made possible by the considerably stronger cotton-nylon carcass, allow for much more efficient tramp iron removal by keeping the load closer to the core of the magnetic field of the head pulley.

"All in all," says the master mechanic of this smooth-running foundry, "these belts save us about 500 man-hours a year in belt repair and replacement. We're very happy with their performance."

• • •

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United States Rubber

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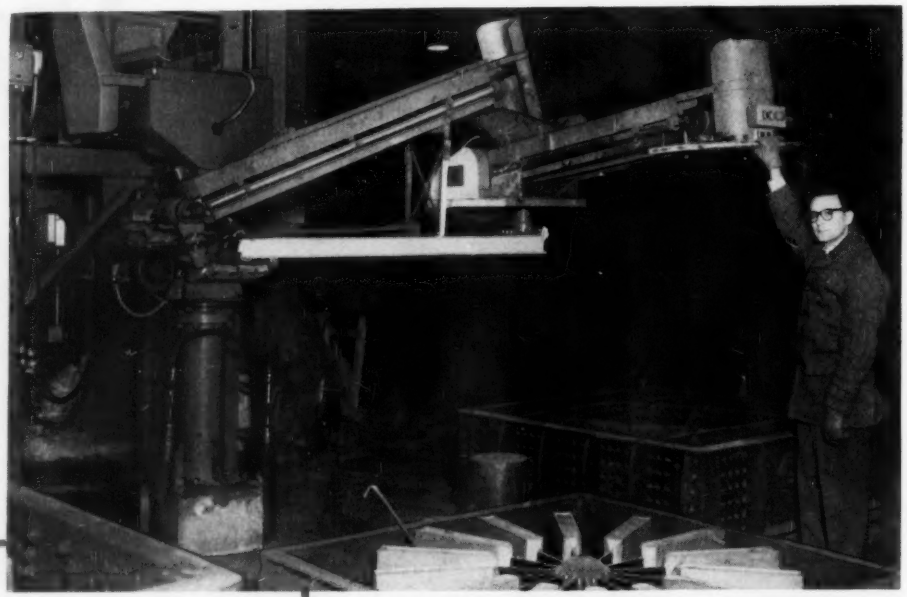
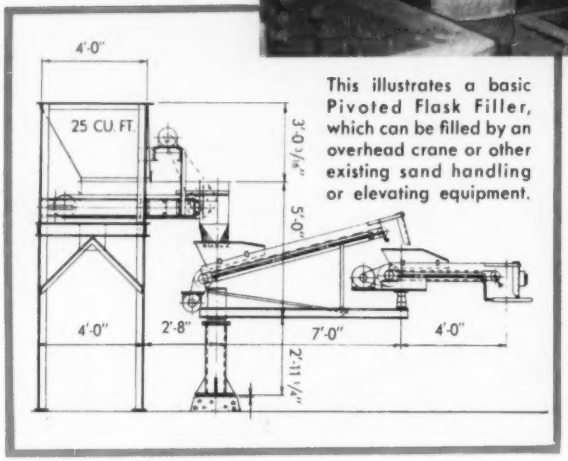
NEWAYGO'S PIVOTING DOUBLE ARM FLASK FILLER

Cuts Large Molds Preparation Time 75%



Double Arm Flask Filler Unit installed in an existing Newaygo Sand Handling System at LEBANON STEEL FOUNDRY CO., Lebanon, Pennsylvania.



This illustrates a basic Pivoted Flask Filler, which can be filled by an overhead crane or other existing sand handling or elevating equipment.

LEBANON reports: "Molds over 60" x 60" are now prepared for the slinger under the flask filler. This consists of facing the pattern with new sand facing, adding about 2 inches of backing sand and ramming into place with air hammers. Gaggers are also added at this point.

"Two common sizes for this operation are 60" x 72" x 42", and 90" x 126" x 48". *We figure conservatively that preparation time on these two sizes and on others in the same range has been cut by 75%.*

"Previously, facing and backing sand was bled off the sand conveyor into wheel barrows or facing sand boxes, which were moved by main bay crane to convenient spots adjacent to the flasks. Sand was then shoveled by hand to prepare the pattern for slinging. Due to the relatively slow method of sand handling we were constantly faced with a congested work area adjacent to the shakeout and slinger.

"The much faster Newaygo Flask Filler Method has virtually eliminated this congestion, resulting in much better use of floor space.

"Having recently (in 1957) installed a Newaygo System, and having lived through the period of change in method, with the normal resistance to change, we were very pleased *two days after we had the Newaygo Flask Filler in operation to have comments from the men as to how much they liked the unit, both from increase in production and the lessened fatigue involved.* We have also found that in removing the facing sand boxes from the operation, we have been able to make better use of the main bay crane."

Complete information and specifications on all Newaygo Foundry Equipment are contained in BULLETIN NO. 56. Send for your free copy.

Mr. Mold Says:

The Newaygo Flask Filler permits using two kinds of sand through the filler by the use of two hoppers, one for facing, and one for backing, — filler capacity up to 50 cu. ft. per minute as needed.

Send for our new 16 mm sound film featuring mechanization. Use of film is FREE.

"Foundry Business is BIG Business"..

NEWAYGO engineering company
NEWAYGO, MICHIGAN

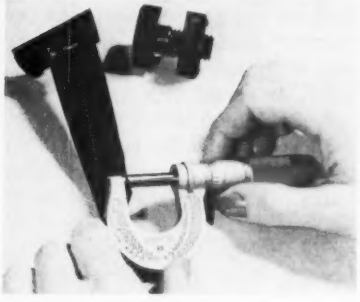
. . . and profitable too, with NEWAY® MOLD HANDLING, SAND HANDLING AND CONDITIONING EQUIPMENT

For More Information
Use Reply Card—Page 53

What's New in Equipment and Supplies

SYNTHETIC PATTERN MATERIAL

Synthetic waxlike pattern material for investment castings is said to produce consistent results in production pattern work. Characteris-



tics include high strength, ability to fill out smallest radiuses completely, and dimensional stability from large to small sections without distortion. The material reportedly can be maintained at elevated temperatures with no effect on physical characteristics, permitting clean scrap to be used many times. It can be used for many applications such as for sprues, runners, chills, doilies, and general sealing work.—**Pattern Materials Div., J. I. Holcomb Mfg. Co.**, Indianapolis 7, Ind.

For More Details Circle No. 450—Page 53

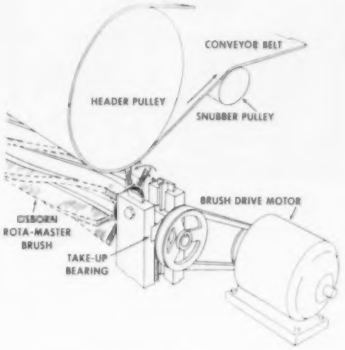
QUARTZ INFRARED ELEMENTS

Slab-faced quartz infrared elements are unidirectional and provide direct-source radiation without reflectors. They radiate long-wave infrared rays directly on the work, minimizing dissipation of energy from the sides. This arrangement results in more nearly uniform emissivity from a larger source surface, with a corresponding reduction in watt density of source and lower surface temperatures. The elements operate with no loss of efficiency and no deterioration. They require no maintenance. — **Ampere Industries, Industrial Process Div.**, 60 Boston St., Newark 3, N. J.

For More Details Circle No. 451—Page 53

BELT CONVEYOR BRUSH

Low-cost Rota-Master brush for cleaning carryback from conveyor belting uses an extruded aluminum mounting and a new synthetic fill material called Korfil P. Inherent qualities of the fill material provide fast, thorough cleaning and unusually long wear life. Because it does not absorb moisture, it will not soften at high temperatures or become brittle at low temperatures.



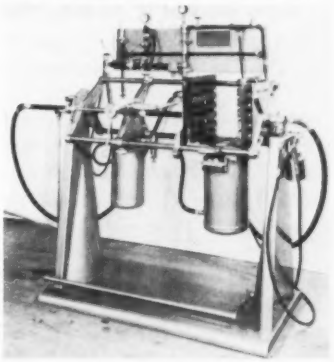
Carryback is the material which adheres to a belt after the belt has passed over the header roll and unloaded. It causes damage to the belt, creates dirty areas and dust problems, and generally lowers efficiency and raises costs. A typi-

Shell Core Machines Set Up, Operate Easily

Two new units have been added to the company's line of shell core machines. The 100 Special is slightly larger than the standard 100 series and is designed to make intricate cores up to 10-in. diam or 28-in. length. It is most useful for pipe fittings and long, slim cores. The 200 series is considerably larger. Cores 30 in. long can be made if the cross-sectional area does not exceed 40 sq in.

Both new machines have all the features of the 100 series, including simplicity in setup and operation.

Each of the units is ready for service and includes air tank, spray gun, blowoff gun, thermom-



eter, and gloves. Thermostatic control units also are available.—**Dependable Pattern Works**, 1634 E. Seventh Ave., Portland 14, Oreg.

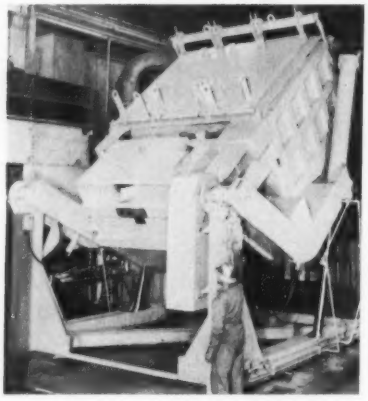
For More Details Circle No. 474—Page 53

cal installation of the cleaning brush is shown in the accompanying drawing.—**Osborn Mfg. Co.**, 5401 Hamilton Ave., Cleveland 14, Ohio.

For More Details Circle No. 452—Page 53

ALUMINUM HOLDING FURNACE

Aluminum induction holding furnace with 30,000-lb capacity and



hydraulically operated three-section cover is ruggedly constructed for continuous service. The chamber lining is of monolithic construction and is nonwettable to aluminum.

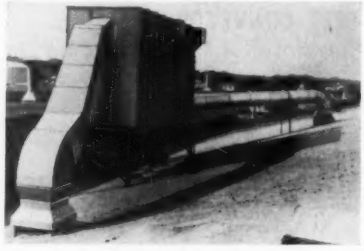
The tilting mechanism is engineered to give safe, fingertip control, and the pouring lip is situated in the axis of tilting. This feature provides a constant pouring arc, regardless of furnace tilt. Ladles or molds need not be shifted during pouring. Cover sections can be lifted singly or together, or the entire cover can be lifted and removed. They are operated by hydraulic cylinders. Power requirements are 350 kw, 480 v, single-phase, 60 cycles, ac.—**Lindberg Engineering Co.**, 2444 W. Hubbard St., Chicago 12, Ill.

For More Details Circle No. 453—Page 53

AIR FILTER

Dustkop Filterkop air filter was developed for operations which involve handling of unusually high volumes of air. Used in conjunction with standard vented Dustkops, it is said to receive all the air collected by such units, to recover nearly 100 per cent of the dust load, dissipate harmful fumes, and recirculate air that has been cleaned thoroughly.

The basic unit consists of heavy-gage steel housing, a hopper, 80 cloth filter tubes, and a shaker mechanism. Accumulated dust automatically is shaken from the tubes



into the hopper at the end of each fan operation. An installation can consist of a single unit or any multiple. One shaker serves two units, and only one air inlet and one air outlet are needed, no matter how large the installation.—**Aget Mfg. Co.**, Adrian, Mich.

For More Details Circle No. 454—Page 53

HOPPER CAR SHAKER

Trackside, permanent-mount vibration inducer moves all types of bulk materials, even those subject

to extreme in-transit packing and bridging, from railroad cars. Cars are placed over conventional track hoppers, car gates opened, and the vibrator head pushed against the side of the car by a hydraulic cylinder, as shown here.

A pushbutton switch activates the drive motor, and the belt-driven vibrator head generates imbalance forces. This impact is transmitted to the side sill of the car and directly to the sloping portion of the hopper. More than 14 tons of force is exerted through the pressure plate to the side of the car without damage.—**Martin Engineering Co.**, Neponset, Ill.

For More Details Circle No. 455—Page 53

DESULFURIZING IRON

A continuous process for desulfurizing molten iron is available for licensing by the company which also has designed equipment to do the job. The company will co-operate with licensee foundries in getting a fabricator to build the equipment in sizes to handle 10 to 150 tons of iron an hour. Iron flows from a cupola into a refractory-lined rotor and a solid, liquid, or gaseous desulfurizing agent is added near the stream of incoming metal. Centrifugal action forces the metal against the rotor wall and holds the treating material against the metal. Reaction time in the rotor is 10 to 20 seconds. Desulfurized metal and slag flow, continuously, out the discharge runner. Automatic slag separation may be obtained by build-

Refractory Gun Has Simplified Controls

R-1A model refractory gun, a modification of the company's R-1 series of one-man guns, incorporates simplified, improved controls for air, water, and material flow. All functions are regulated by a small, four-way pneumatic valve at the nozzle. No other accessory power is required.

The new model is said to provide easier operation, decreased maintenance costs, and an improved safety factor. Units are available in capacities to 70 cu ft. The gun pictured has 3-ton capacity. Conversion kits with instructions for modifying older R-1 models also are available.—**Ridley & Co.**, Dept. F-5, 11275

Massachusetts Ave., Los Angeles 25, Calif.

For More Details Circle No. 475—Page 53

TODAY'S PROFIT-ENGINEERED PUSH-BUTTON FOUNDRY IS

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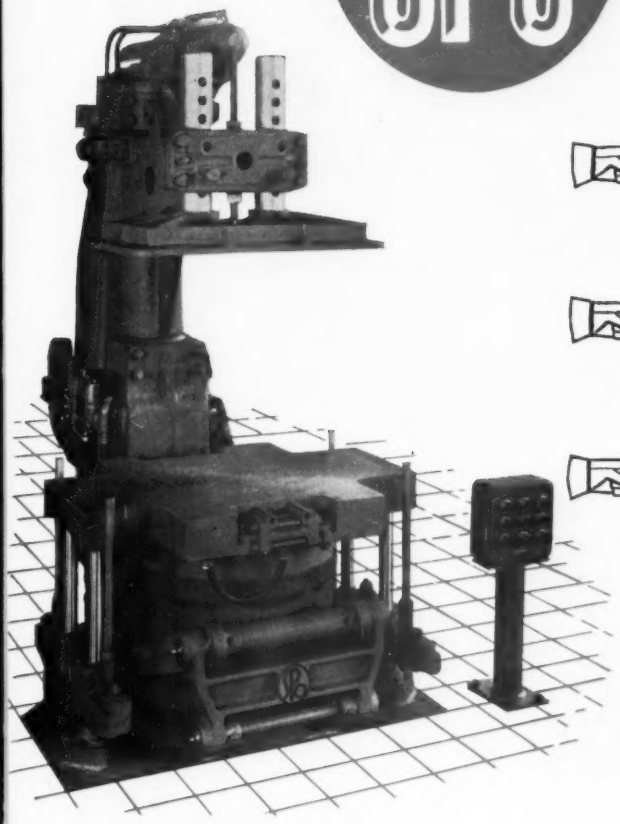
ENGINEERED
EQUIPPED
EFFICIENCIED

(Production Rated and Guaranteed)



SPO MORE production per day

Produce a wide variety of quality castings—in greater number—with SPO automated machines engineered to produce better molds—fast, economically—even without operator attention!

SPO MORE capacity with LESS space

Be prepared for INCREASED production *without* expense of increased space! SPO automated machines telescope several production operations in ONE unit—enable you to MULTIPLY output with your present plant.

SPO CUTS costs

SPO automated machines (1) save time on EVERY operation, (2) are ruggedly built to cut down-time to a minimum, (3) improve casting quality by producing sound, uniform molds, (4) provide maximum safety and minimize operator fatigue.

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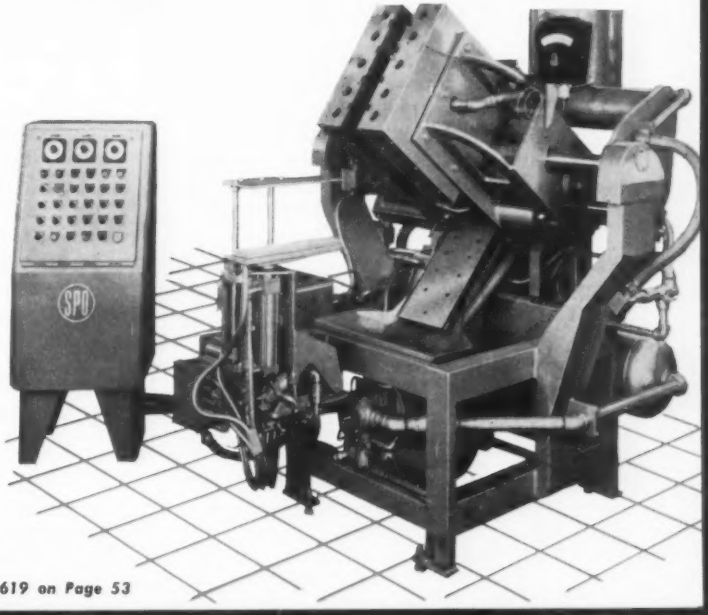
CLEVELAND 25, OHIO, U. S. A.

MODEL 2190
Jolt-Squeeze-Strip MOLDING MACHINE

Features SPO's patented "inverted jolt" mechanism that guarantees maximum operating efficiency and minimum maintenance. Has a 10" pattern draw, 12" squeeze stroke, 1500-lb. jolt capacity and 22,000-lb. squeeze capacity on standard 80 p.s.i. line pressure. Pin centers: left to right, 27½ to 42"; front to back, 18 to 34".

MODEL SC-30
SPO's exclusive Angle-Blo holo-core MACHINE with fully automatic unloader

Blows, cures, strips, unloads a wide variety of hollow cores or shell molds, recharges sand magazines—automatically and *without* operator attention. Handles core boxes up to 16x21x9 inches, blows 30 lbs. of solid core.



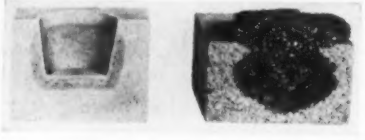
Circle 619 on Page 53

ing a dam in the runner. Field tests with a 60-ton-an-hour unit indicate that sulfur content can be reduced generally to a level of about 0.02 per cent. This could be more or less, depending upon sulfur content of incoming iron and amount of desulfurizer used. Temperature drop of metal under treatment is between 40 and 75° F.—**Diamond Alkali Co.**, Union Commerce Bldg., Cleveland 14, Ohio.

For More Details Circle No. 456—Page 53

TAB-ALUMINA CASTABLE

Hydrecon TabCast is a tab-alumina castable refractory in the 3500° F range. Its crushing strength is 10,800 psi at 1500° F and 11,200 psi at 2500° F. Iron content is less



than 0.1 per cent, and alumina content is 93.66 per cent.

The material comes in dry form and can be poured or cast after it has been mixed with water. The manufacturer states that its resistance to corrosive furnace gases, extreme temperatures, abrasion, and corrosion drastically reduces downtime, maintenance, and repairs. Illustration compares penetration and slag reaction under identical conditions in Tabcast, on left, and in commonly used brick. — **J. H. France Refractories Co.**, Snow Shoe, Pa.

For More Details Circle No. 457—Page 53

TRACTOR SHOVEL

Trojan 124 is a four-wheel drive tractor shovel with interchangeable 1½-yd general utility bucket, 1¼-yd heavy material bucket, and 2-yd light material bucket. The unit's 10,000-lb lifting capacity permits it to function at maximum efficiency with any of the three.

Model 124 is powered by either a GM 3-71 diesel engine, a Hercules DD-298 diesel engine, or a Hercules GO-298 gas engine. Its planetary torque converter has a 3.5 to 1 torque ratio. Low-curve safety arms permit straight-line horizontal thrust of the bucket, thus utilizing the full power of the unit. These safety arms also give the operator 360-degree vision and enable him to carry the load at wheel level, affording greater stability. — **Yale & Towne Mfg. Co., Trojan Div.**, Batavia, N. Y., or San Leandro, Calif.

For More Details Circle No. 458—Page 53

SAFETY GLASSES

C-20 safety glasses are designed to combine long-wearing comfort and functional good looks with the protection of safety glasses. Frame

is combination plastic and metal, and a durable front of nickel-silver completely encircles the lenses, assuring maximum frontal protection. Design is such that there is nothing to break, shrink, or warp.

Lenses are heat treated for impact protection. They reportedly can withstand a blow up to 14 times heavier than that required by Federal specification. The lens shape provides a wide field of vision and will accommodate single vision or bifocal prescriptions. For glare protection, lenses are available in two shades of green. Side shields can be attached easily and quickly.— **Safety Products Dept., Bausch & Lomb Optical Co.**, 635 St. Paul St., Rochester 2, N. Y.

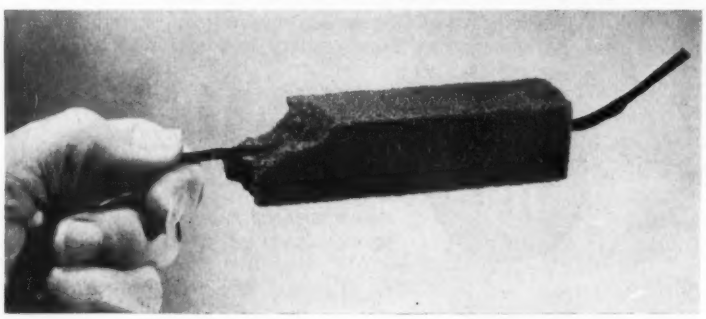
For More Details Circle No. 459—Page 53

OVERHEAD CRANES

N-TRMD series of overhead cranes for Class III industrial service has up to 20-ton capacity and 60-ft span. The entire series has been re-engineered with extensive use of standardized components and interchangeable parts for mass production, assembly line economies.

Features include heavy - duty hoist, heavy-duty steel wheels on bridge and trolley, precision ball

Core Reinforcement Is Made of Fiberglass

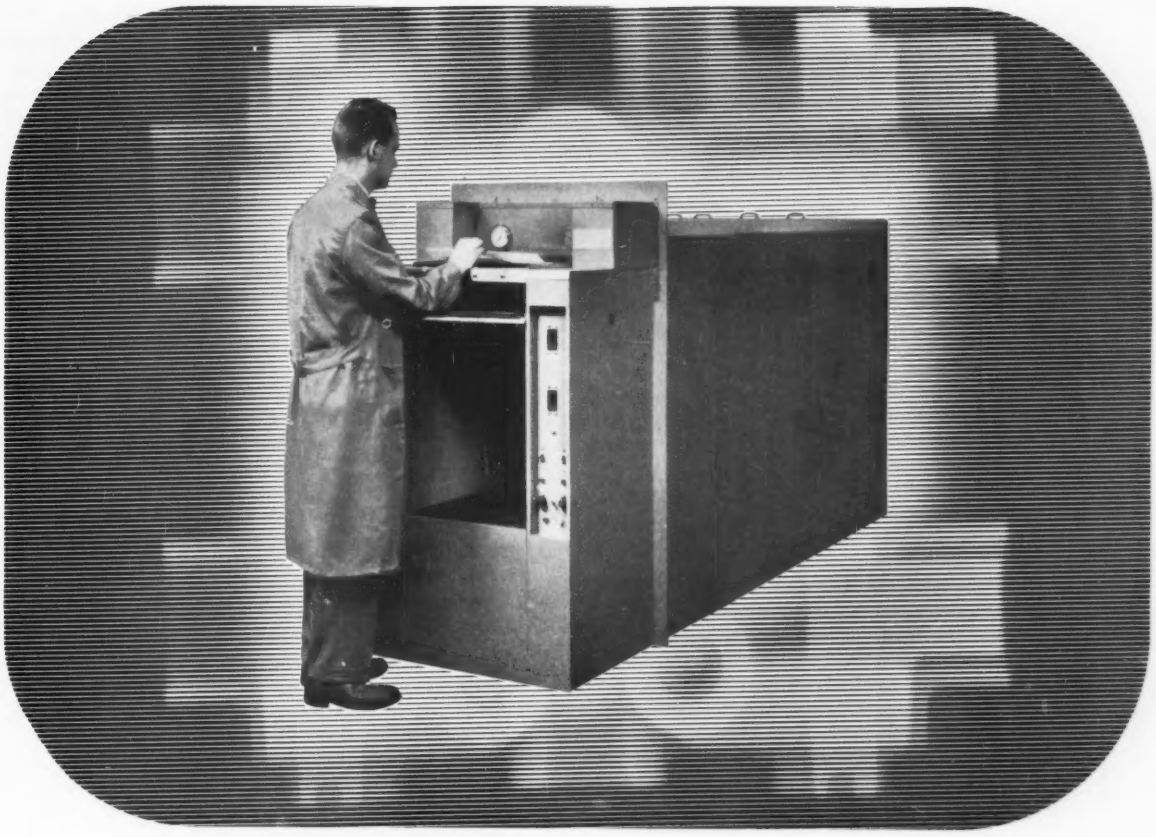


Pitt-Cor is a cordlike, resin-impregnated fiberglass material which is used to reinforce cores. Soft and pliable before baking, it takes on strength and rigidity after it has been baked in a core, as shown here. Once the casting has been poured, the reinforcement loses its strength and breaks up completely during shakeout.

The new material is clipped to the desired length, formed to the contour of the core section to be reinforced, and baked with the core. It also can be formed and prebaked and set into the core.

Because Pitt-Cor has the same coefficient of expansion as core sand, it is said, the core will not crack away from the reinforcement. The material will not deform after curing and will not adhere to the casting if it is exposed to the metal during pouring. It is adaptable to all methods of baking, including dielectric. Sizes available are about 3/32, ⅛, and 3/16 in. in diam. Pitt-Cor is made by Pittsburgh Plate Glass Co.—Distributed by **Archer-Daniels-Midland Co., Federal Foundry Supply Div.**, 2191 W. 110th St., Cleveland 2, Ohio.

For More Details Circle No. 476—Page 53



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Kodak offers you automation in film processing—radiographs of uniform high quality, dry and ready to read in 13 minutes.

Film hangers are eliminated. Exposed films are merely removed from the film exposure holders and fed directly into the processor. Kodak Industrial X-ray Film, Type AA and Type M—sheet films or continuous lengths from 70mm to 17 inches wide—go through the system at 38 inches per minute. *And* only 22 inches of the unit's 10-foot 10-inch length need extend into the darkroom itself.

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Who's going to blast the first missile to the moon? As yet no one knows the answer, but we do know that AMASTEEL SHOT & GRIT, which are genuine electric steel abrasives when missiled through the space of a blasting cabinet, have the following count-down characteristics:

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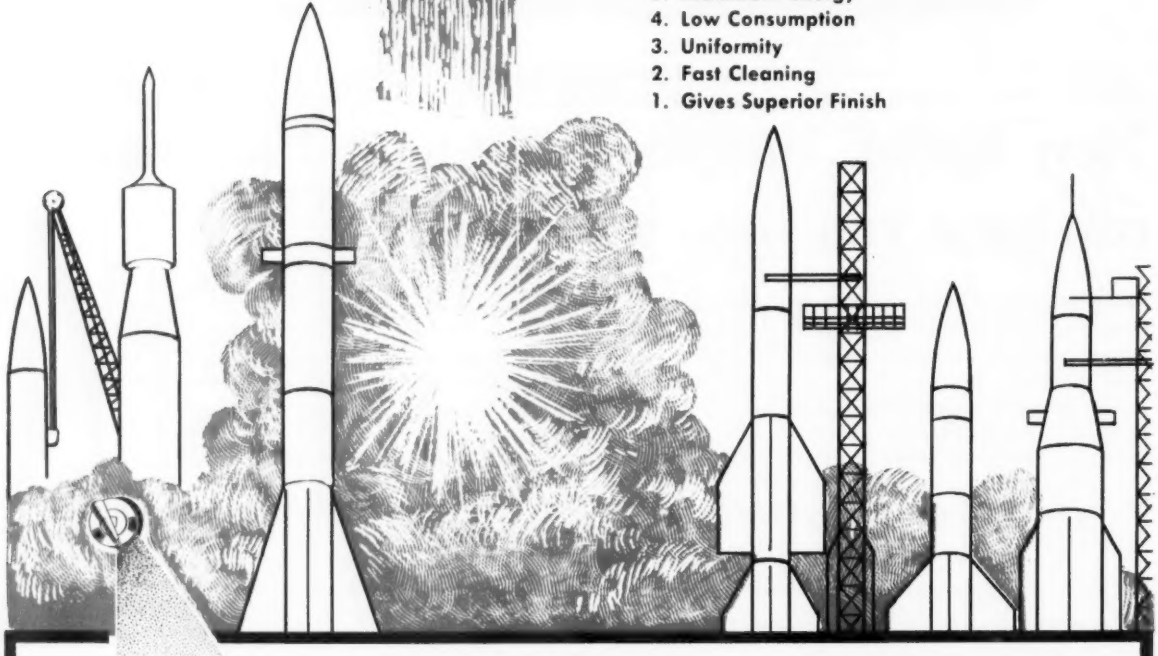
6. Laboratory Control
5. Maximum Energy
4. Low Consumption
3. Uniformity
2. Fast Cleaning
1. Gives Superior Finish



THE EARTH'S BEST BLAST MATERIAL

ALLOY METAL ABRASIVE CO.

ORIGINATORS OF CAST STEEL SHOT

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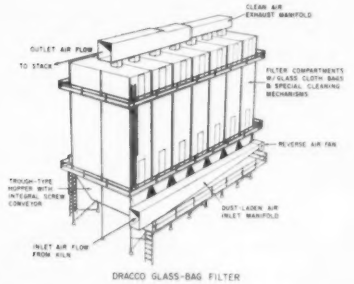
Phone: NOrmandy 3-8529 Branches in principal cities

and roller bearings, fluid-coupled bridge and trolley drives, full magnetic pushbutton control, and magnetic bridge brake.—**Borg-Warner Industrial Cranes,** 1536 S. Paulina, Chicago 8, Ill.

For More Details Circle No. 460—Page 53

GLASS-BAG FILTER

Design improvements in dust filter which incorporates glass cloth filter bags include dust removal by sound. In addition to the new sonic


CLEAN AIR EXHAUST MANIFOLD
OUTLET AIR FLOW
TO STACK
FILTER COMPARTMENTS W/GLASS CLOTH BAGS & SPECIAL CLEANING MECHANISMS
REVERSE AIR FAN
TROUGH-TYPE HOPPER WITH INTEGRAL SCREW CONVEYOR
DUST-LADEN AIR INLET MANIFOLD
INLET AIR FLOW FROM KILN
DRACCO GLASS-BAG FILTER

mechanism, two alternate means for cleaning the filter bags are offered: 1. Reverse air flow. 2. Gentle swinging action. All periodically remove dust buildup accumulation, preventing excessive pressure drop across the filter and maintaining operating efficiency. Drawing shows a seven-compartment dust collector.—**Dracco Div., Fuller Co.,** 4063 E. 116th St., Cleveland 5, Ohio.

For More Details Circle No. 461—Page 53

HOIST HOOK SAFETY LATCH

Inexpensive safety latch for hoist hooks prevents accidental detaching and dropping of loads. It can be

fitted on any hoist hook in minutes, with simple hand tools. The safety device has two major parts, a clamp-on collar and a corrosion-resistant, spring-loaded latch which fits into the hook opening. The collar is made of a manganese bronze alloy and is held permanently in place by a bolt and self-locking nut. The latch is held firmly in place by a stainless steel spring. This device is available in four sizes for ¼ to 3-ton units and will fit any manufacturer's hooks. — **Harrington Co.,** Gravers Road, Plymouth Meeting, Pa.

For More Details Circle No. 462—Page 53

EPOXY PATCH KIT

Hysol epoxy patch kit 6C is produced for easy, economical, and permanent repairs of tools, castings, and heavy machinery. The epoxy is said to be strong enough to assure perfect repair for both ferrous and nonferrous castings.

The kit contains two flexible tubes, one of base resin, the other of hardener. Mixing requires only that an equal length of bead be squeezed from each tube to provide a smooth, no-flow material ready for room-temperature use. Complete hardening takes place in 1 to 2 hr, but can be accelerated by application of low heat.—**Houghton Laboratories Inc.,** Olean, N. Y.

For More Details Circle No. 463—Page 53

ABRASIVE GRAIN COATING

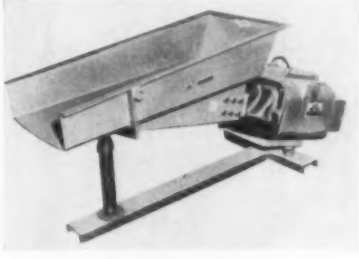
Company claims a 300 per cent increase in the efficiency of grinding wheels made with A-1100 Silane coating for abrasive grains. This improvement is measured in terms of pounds of steel removed per hour in relation to pounds of wheel wear per hour. Addition of the silicone-type coating increases wheel cost only ½ to 1 per cent, it is claimed.

The coating reacts chemically with both resin and grit and acts as a bridge between organic and inorganic materials. Other results reported include a 25 per cent increase in breaking strength of wheels; a 45 per cent improvement in flexural strength on bars tested at both room temperature and 200° C; and an improvement of 14 per cent in wet strength retention of test bars immersed in water for 21 days.—**Silicones Div., Union Carbide Corp.,** 30 E. 42nd St., New York 17, N. Y.

For More Details Circle No. 464—Page 53

VIBRATORY FEEDER

Hi-Vi vibratory feeder Model 70A is rated at a capacity of 50

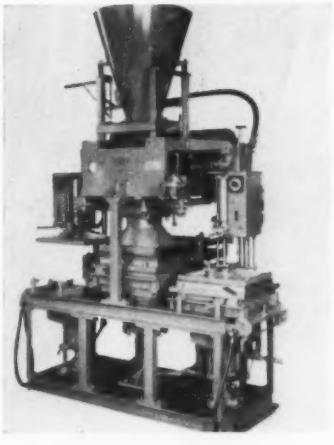


tons per hour. Developed to meet the demands of a wide range of heavy material handling programs,

Machine Blows, Strips, and Gasses CO_2 Molds

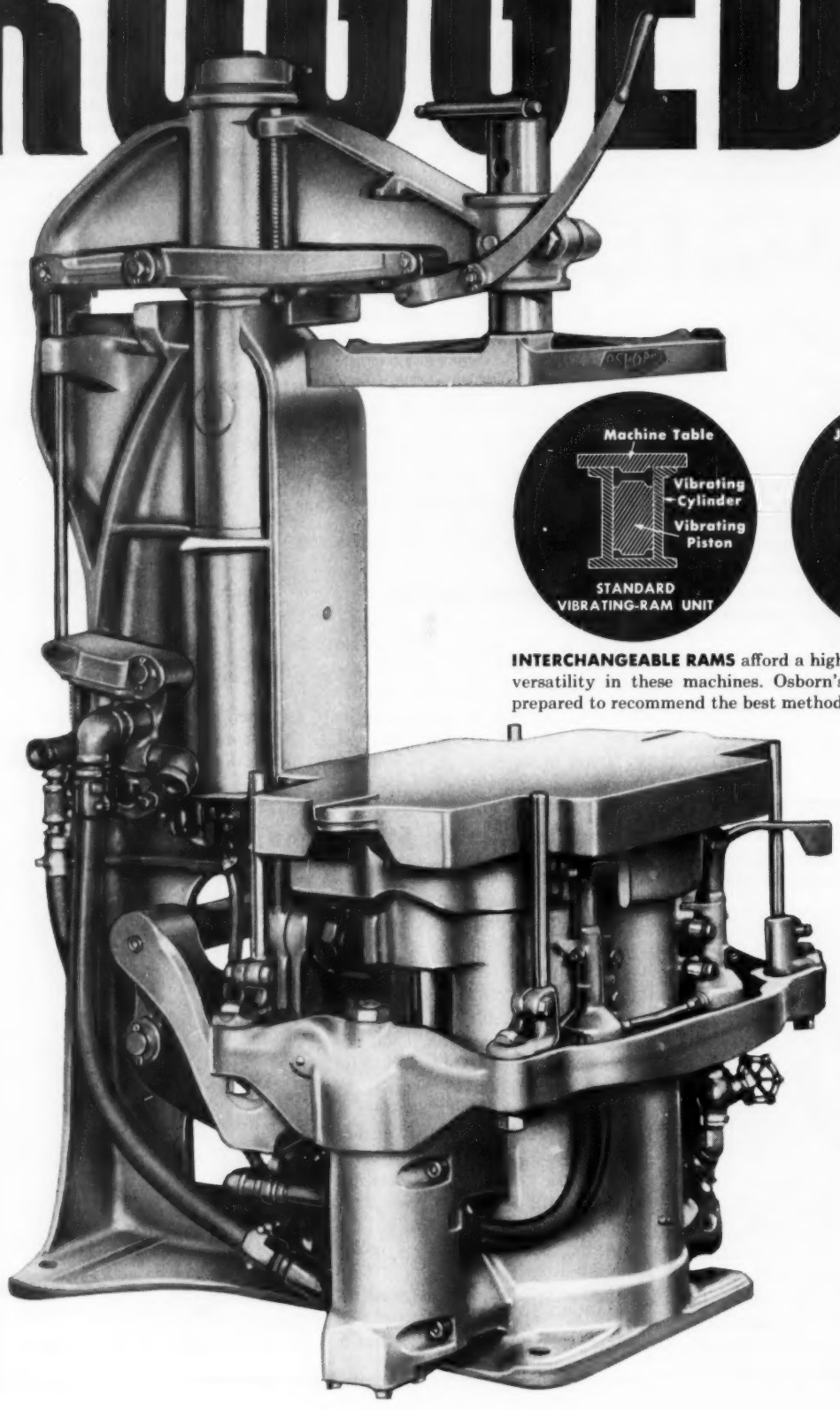
CO_2 molding machine combines one blow and squeeze and two gassing and stripping stations into one unit for easy handling of mold patterns. Patterns are mounted on carriages which are moved manually from blowing to gassing position. Squeeze plate travel is air operated. The squeeze operation is used to obtain adequate mold density to produce good detail and casting finish.

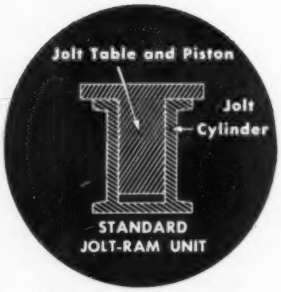
Electric reset timers control gassing and stripping cycle. Maximum standard mold size is 12 x 14 in., and thickness of molds varies from ¾ to 2½ in. Production is said to be as much as 100 complete molds—cope and drag—per hour.—**Redford Iron & Equipment Co.,** 20733 Glendale, Detroit 23, Mich.



For More Details Circle No. 477—Page 53

RUGGED...





INTERCHANGEABLE RAMS afford a high degree of production versatility in these machines. Osborn's Sales Engineers are prepared to recommend the best method for your work.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION MEMBER FEMA

FLEXIBLE

Vibrating Squeeze Stripper and Jolt Squeeze Stripper machines . . . engineered for dependable, precision molding performance by OSBORN

Designed and built around a single basic, dependable machine—today's complete line of Osborn Vibrating Squeeze Strippers and Jolt Squeeze Strippers gives the foundryman a choice of ruggedly-built units with the flexibility to handle a wide range of molding requirements.

In addition to the optional features shown below and the choice of vibrating-ram or jolt-ram actions—there are other important advantages in the line:

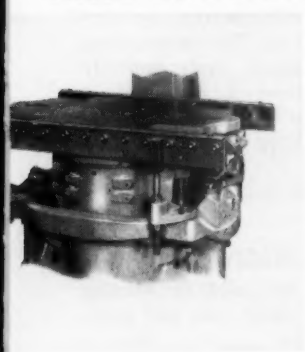
- Oil-controlled pattern draw with automatic acceleration from slow to fast . . . and automatic cushioning. Draw stroke is adjustable for any length of travel up to maximum—and for speed of slow draw. Pattern vibrator control can be set for required vibrating intervals—automatic synchro with the draw mechanism.
- Lifting pins adjustable for an extensive range of flask shapes and sizes . . . carried on cast draw frame. Equipment design demands that all draw mechanism parts function with uniform accuracy.
- Machines are available with squeeze cylinder diameters of 12″, 14″, 16″, 19″ and 21″ sizes.

In foundries throughout the country today—both types of all Osborn Squeeze Stripper models are on the job . . . producing at lower cost, higher-profit.

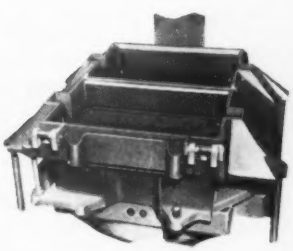
For full details on your applications—call in your Osborn Foundry Specialist to discuss your plans and problems soon. Write *The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

WRITE FOR YOUR COPY . . . Folder No. 71-A gives complete specifications, operating data, applications and design features on the Osborn line of Vibrating Squeeze Stripper and Jolt Squeeze Stripper machines.

THESE OPTIONAL FEATURES FOR ALL MODELS . . . GIVE ADDED FLEXIBILITY

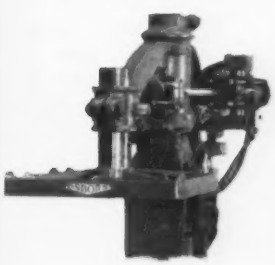


Roll-on, Roll-off Stripping rails



Cope and Drag Simultaneously

Single Push-Button Automatic Control Panel



Power-Operated Squeeze Head

leader in mechanization for the foundry

OSBORN®

MOLDING MACHINES • CORE BLOWERS • SHELL MOLDING MACHINES • BRUSHING MACHINES • INDUSTRIAL BRUSHES

Circle 622 on Page 53

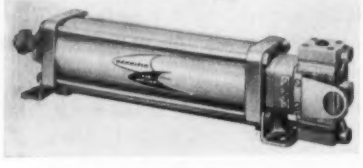
it incorporates the construction features of the company's smaller feeders in the line. These include electro-permanent magnetic drive system, and a spring system of epoxy-boned fiberglass.

Essentially an automatic, constant-volume feeder of bulk materials, the 70A also is adapted to spreading, drying, or agitating materials, handling hot materials, or moving materials into hot areas. Suspended or base-mounted units are offered.—**Eriez Mfg. Co.**, Erie 6, Pa.

For More Details Circle No. 465—Page 53

AIR MOTOR

Combination of air power cylinder and electrically actuated control valve with built-in speed controls combines all three basic com-



ponents in a single air power package. Installation requires only one airline connection and simple wiring to the solenoid-actuated, pilot-operated valve.

The head cylinder has a rustproof body and an induction case-hardened piston rod with hard chromium-plated finish. Control valve is of a reciprocating disc design that will operate even when the valve is blanketed by chips or grinder dust or splashed with coolant. These air motors are available in five bore sizes and in the customer's choice of stroke length.—**Hannifin Co.**, a division of Parker-Hannifin Corp., Dept. 238, Des Plaines, Ill.

For More Details Circle No. 466—Page 53

TESTING MACHINE

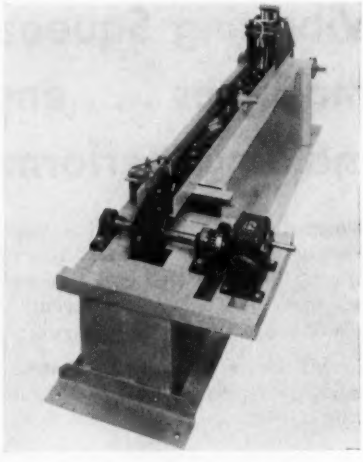
Air-operated creep-stress rupture testing machine is claimed to apply uniform loads and to maintain them indefinitely. Infinitely variable loads to 12,000 lb are applied without shock and maintained regardless of normal fluctuations in line pressure. Load is indicated by either of two precision gages, for 0-3000 and 0-30,000-lb ranges.

Specimens can be tested at any temperature from 0 to 1800 or 2000° F. Temperature is maintained automatically by an electrically operated furnace which swings in or out of the testing area. Automatic stress-strain curves are plotted on a built-in XY recorder at the top of the machine. A wide selection of extensometers is available for use with the unit.—**Tinius Olsen Testing Machine Co.**, 839 Easton Rd., Willow Grove, Pa.

For More Details Circle No. 467—Page 53

SEQUENCE PROGRAMMER

Sequence programmer is a control device to operate in conjunction with conveyors or in-line machines. It accepts a continuously changing sequence and initiates proper action to sort, route, mark, reject, or pre-



vent interference of articles on a conveyor or machine.

The unit permits automation of warehousing and shipping dock conveyor systems by eliminating the need for personnel to identify articles more than once. Complete automation can be achieved when circumstances permit an automatic signal to identify items. It contains no electronic tubes or amplifiers, tape handling equipment, springs, or other fragile parts and can be understood and operated by untrained personnel. The programmer can be powered and remotely mounted to control machines in difficult places.—**Automation Engineering Inc.**, 1214 Royal Ave., Louisville 4, Ky.

For More Details Circle No. 468—Page 53

COB GRIT ABRASIVE

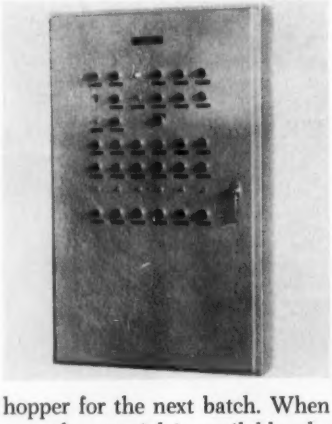
Cob grits are used in blasting equipment to clean core and molding sands from castings. Because the grits are lighter than other abrasive blasting materials, however, their use requires certain adjustments in the blasting equipment to assure efficient performance. The air suction pipe and air vents leading to the dust collector must be

Unit Controls Complete Sand Mixing Cycle

Unit controls moisture and complete mixing cycle of any batch-type mixer with a traveling weigh batcher. It closes the discharge door, charges all materials into the mixer, operates dampers, controls length of mixing time, and discharges the mixer. Switch control permits having the mixer go through one cycle and stop or to run continuously from one batch to another as long as material is supplied to the mixer.

One to six ingredients or any combination from one to six can be gathered. Scale settings control amount of material from each bin.

The moisture control probe is sensitive to both temperature and moisture. Controls of the timer are arranged so that the unit will not start if there is insufficient material in the batch



hopper for the next batch. When enough material is available, the next cycle begins. Once it has started into the mixing cycle, it will continue to operate regardless of incoming material until the batch reaches the discharge position. — **Hartley Controls Corp.**, Neenah, Wis.

For More Details Circle No. 478—Page 53

Need an oscillating conveyor now?

3 LINK-BELT types cover every need—all are immediately available from stock

Yes, Link-Belt makes a specific type of oscillating conveyor for every type of service.

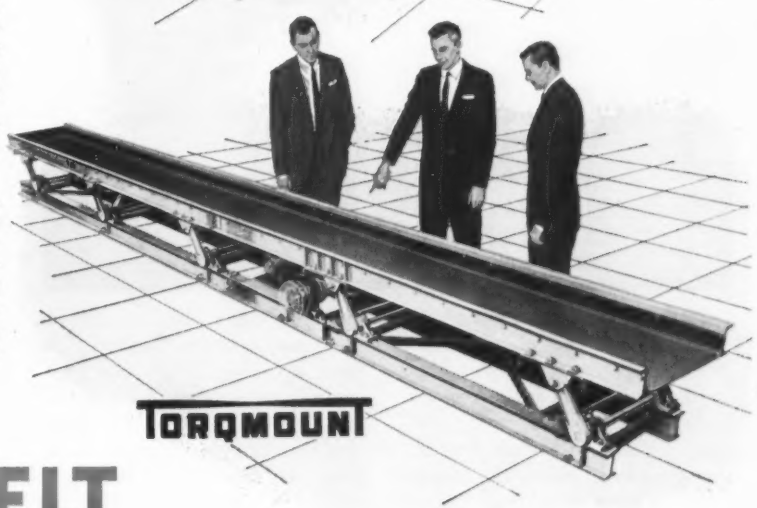
FLEXMOUNT for light-duty service. Ideal for gentle handling up to 25 TPH of 100-pounds-per-cubic-foot material. Widths of 8, 12 and 18 in.—all with 4-in. deep troughs. Flexmounts are pre-engineered — available from stock in 5- and 10-ft. sections.

COILMOUNT for medium-duty service. For applications up to 80 TPH of 100-pounds-per-cubic-foot material. Widths of 10 and 20 in. with 6-in. deep troughs. Available from stock in completely assembled 5- and 10-foot sections.

TORQMOUNT for heavy-duty service. For severe service requirements on installations with capacities up to 350 TPH of 100-pounds-per-cubic-foot material. Widths up to 48 in. with 8-in. deep troughs. Popular 36-in. size stocked.

In every case, Link-Belt POSITIVE ACTION controls the load at all times . . . assures continuous, uniform flow of materials regardless of surges. And each type functions as near to NATURAL FREQUENCY as possible, minimizing power requirements.

For the best in light-, medium- or heavy-duty conveying, call your nearby Link-Belt office or authorized stock-carrying distributor. Or write for new Book 2744 containing complete data on all three types.



LINK-BELT

OSCILLATING CONVEYORS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 15.121

closed off almost completely. Feeder valves and openings must be opened so that enough cob grits can enter the machine.

In some plants a wire screen has been put in the elevator over the housing in the air suction pipe to prevent good grits from being sucked into the dust collector.—**Ti-Co Industries Inc.**, P. O. Box 185, Tipton, Ind.

For More Details Circle No. 469—Page 53

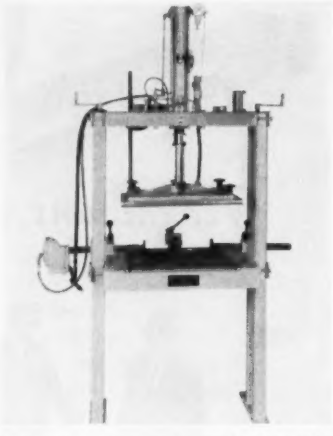
GRAPHITE LUBRICANT

KGP is pure, synthetic, colloidal graphite permanently suspended in neutral oils and blended in other carriers. Made by high-temperature combustion of petroleum in an electric furnace, it is inert and remains a lubricant up to 5000° F. Because of its molecular structure and because it takes on a negative magnetic charge during processing, it will not build up on itself. The negative charge also serves to keep the particles in permanent suspension. Graphite particles of KGP are extremely small. It is available in a variety of forms for differing applications, including high-temperature lubrication and as a parting medium on patterns and dies.—**King Graphite Products Inc.**, 21949 S. Telegraph Rd., Trenton, Mich.

For More Details Circle No. 470—Page 53

CO_2 GASSING MACHINE

Pressure gassing machine for CO_2 hardening of sodium silicate-bonded cores and molds is said to incorporate unusual and desirable features. It offers a 25 x 30-in. conveyorized table, cast spacers for quick vertical height adjustment, a 20 x 24-in. universal gassing head and air-actuated timing controls.—**Alphaco Inc.**, 500 State St., P. O. Box 827, York, Pa.



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BENCH-TYPE CORESHOOTER

Model H2, 5R is a bench-type coreshooter with 8½-lb core capacity and stationary sand reservoir. Capacity of the sand hopper is about 100 lb. The sand slide on top of the machine is closed by an air cylinder. Fast-acting, easily adjusted side clamps can be turned out of the way if not needed. Heads and height of coreboxes on the table can be changed rapidly. The machine is operated with one lever. Moving the lever up fills the machine with sand, and moving it down shoots the corebox. Maximum corebox height is 9 in. Shoot cycle with 3/16-in. clearance between corebox and shoot head is 2 seconds.—**Hansberg Shooters Inc.**, 3213 Central St., Evanston, Ill.

For More Details Circle No. 472—Page 53

PORTABLE AIR HEATER

Economy model has been reinstated in the company's line of Herman Nelson portable air heaters. It provides up to 270,000 Btu per hour and operates on either gasoline or fuel oil, without adjustment. Canvas ducts direct heat to the proper working area while combustion fumes are vented away. Simple controls and quiet operation also are improvements to the unit.—**American Air Filter Co.**, 215 Central Ave., Louisville 8, Ky.

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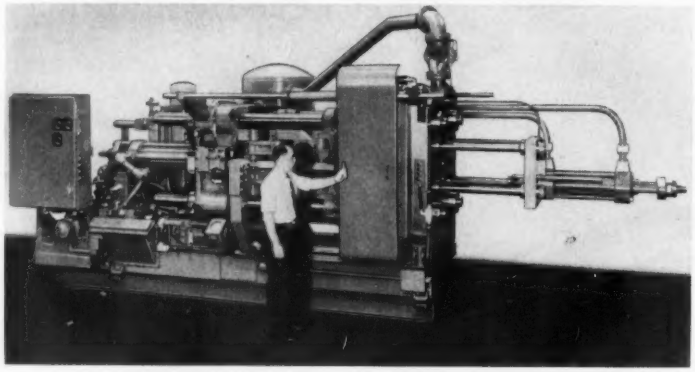
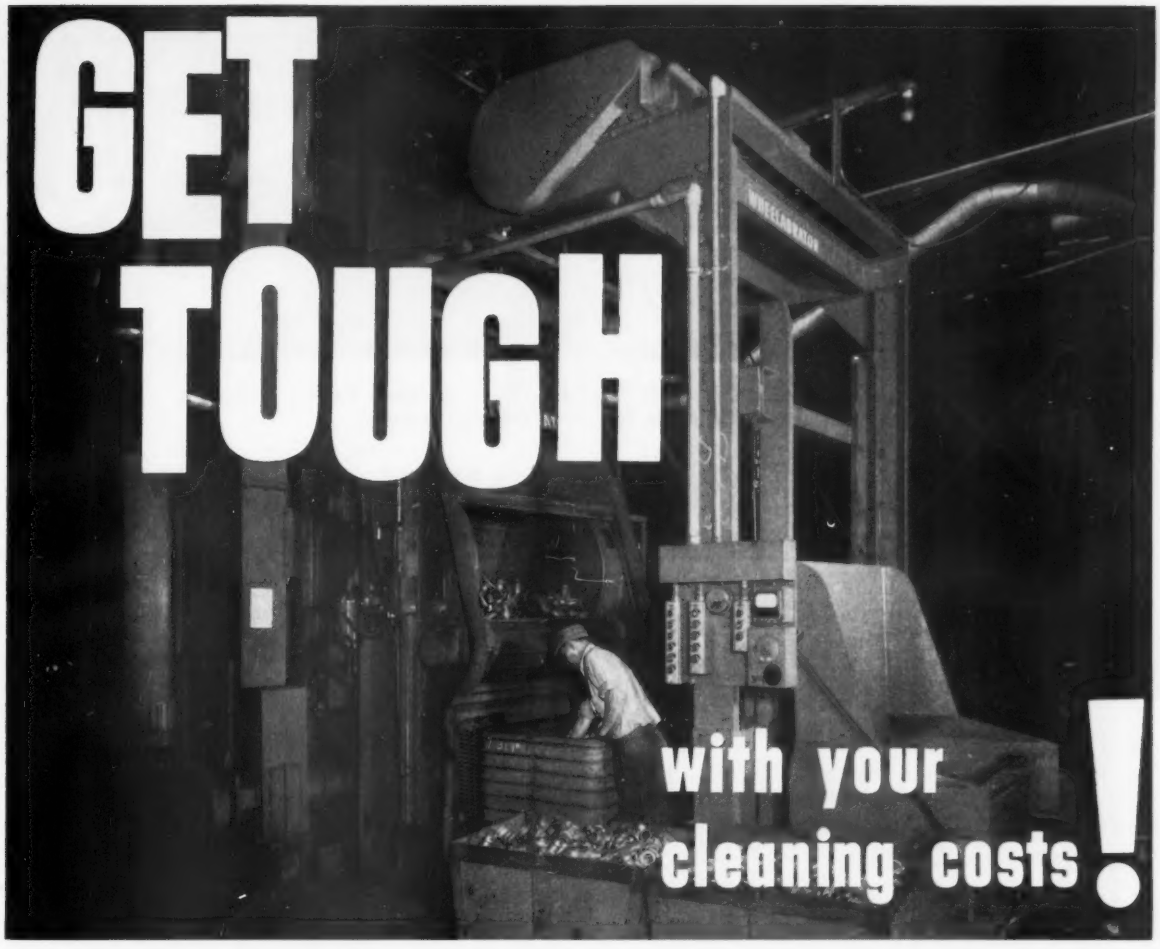
600-Ton Diecasting Machine Is Flexible



New 600-ton machine is designed for all types of cold chamber diecasting, including hand ladling, automatic ladling, or automatic feeding through the company's Vacufeed system. The latter combines automatic feeding with vacuum diecasting.

Aluminum diecastings weighing up to 10 lb can be produced on the unit, which has a die stroke adjustable from 12½ to 18½ in. Die plates measure 47 x 46½ in., providing 28½ x 28½-in. clearance between tie bars. The shot cylinder is provided with an adjustable slow start to permit complete venting of sleeve and runner system. To accommodate sleeves of different lengths, the shot cylinder stroke is adjustable in a 6-in. range, from 14 to 20 in.—**Reed-Prentice Div., Package Machinery Co.**, East Longmeadow, Mass.

For More Details Circle No. 479—Page 53



like they did at Canton Malleable Iron Co.

When management at Canton Malleable Iron Co. decided **to get tough** with their cleaning costs, they gained the savings they wanted with a Wheelabrator Super Tumblast®.

Loads that formerly required 30 to 45 minutes of cleaning time now are cleaned in only 9 minutes. The Super Tumblast easily handles more than two tons of small castings per hour — four times the previous volume cleaned with two older batch-type blast cleaning machines.

Sixteen man-hours of cleaning time are saved daily. Maintenance costs are at an all-time low. And with all its increased cleaning power, the Super Tumblast is making big savings in abrasive costs as well.

One of the unique features of this Wheelabrator Super Tumblast is the automatic loader, designed to handle two different sizes of tote boxes. By handling one large tote box or two small ones at the same time, it has substantially eased work-handling problems.

In over 125 installations, the Wheelabrator Super Tumblast has **proved** its unequalled ability to cut cleaning costs through higher production capacity, lower labor requirements, and lower costs for abrasive and maintenance. Get this assurance of results in your attack on cleaning costs, by calling your Wheelabrator Sales Engineer.

Write for this illustrated report of savings actually achieved through use of the Wheelabrator Super Tumblast. Ask for catalog 145-D.

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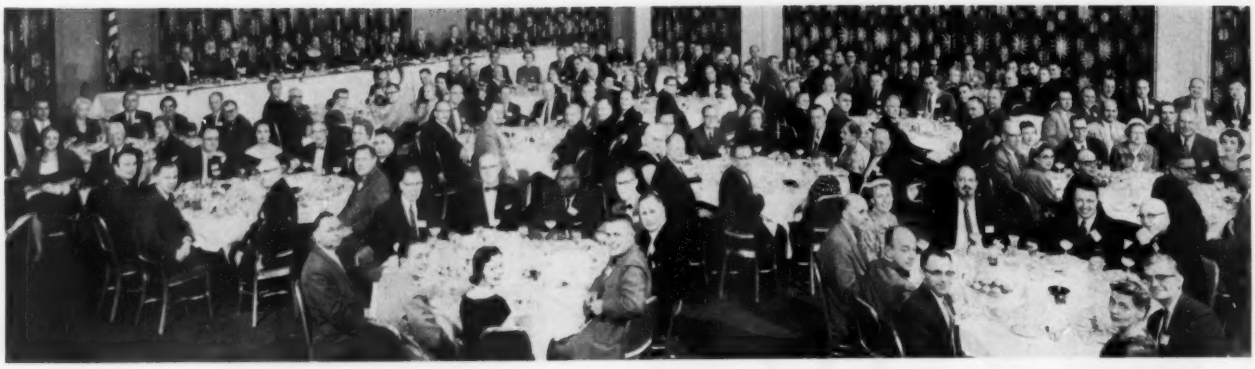
Circle 624 on Page 53



Irwin Such, editor-in-chief, STEEL, and Mrs. Such described Russian political, industrial, and social life at the foundation's annual banquet

F E F Conference Stresses

CASTING DESIGN

By EDWIN BREMER and ROBERT H. HERRMANN

● "CASTING Design in Engineering Education" was the theme of the Foundry Educational Foundation's 12th annual College-Industry Conference. The meeting, attended by 168, was held March 18-19 at Statler-Hilton Hotel, Cleveland.

FEF President Frank X. Bujold, Ford Motor Co., Dearborn, Mich., presided over the annual business meeting and expressed appreciation for assistance of professors of the participating universities in advancing engineering science of the casting process. He noted that during the past year there has been a slight increase in the number of university foundry courses, an increase of over 3 per cent in the number of foundry instructors, and an investment of $144,000 in foundry laboratory facilities. In the future, seven of the schools participating in the FEF program expect to construct new engineering buildings which will include foundry laboratories.

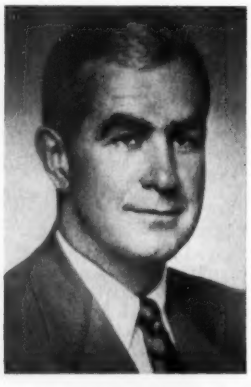
In closing, Mr. Bujold referred to the problem of obtaining adequate support for the FEF program. Strong competition for educational funds requires greater effort to obtain the necessary money.

Officers and Trustees—Officers for the coming year are: Frank G. Steinebach, FOUNDRY, president; R. B. Parker, American Brake Shoe Co., New York, vice president; Warner B. Bishop Jr., Archer-Daniels-Midland Co., Federal Foundry Supply Div., Cleveland, secretary, and E. M. Knapp, Ferro Machine & Foundry Co., Cleveland, treasurer.

Trustees-at-large are A. W. Anderson, Manufacturing Research Dept., International Harvester Co., Chicago; E. E. Braun, Central Foundry Div., General Motors Corp., Saginaw, Mich.; L. O. Hofstetter, Brumley-Donaldson Co., Los Angeles; E. H. King, Hill & Griffith Co., Cincinnati; W. E. Sicha, Aluminum Co. of America, Cleveland, and Mr. Bujold.

Trustees appointed by founding member societies of FEF are: American Foundrymen's Society—W. L. Kammerer, Midvale Mining & Mfg. Co., St. Louis; Foundry Equipment Manufacturers Association—D. E. Davidson, Link-Belt Co., Chicago, and C. W. Vokac, Electric Furnace Div., Whiting Corp., Harvey, Ill., to fill an unexpired term; Gray Iron Founders' Society—F. J. Sherwin, Chicago Hardware Foundry Co., North Chicago, Ill.; Malleable Founders' Society—L. E. Roby, Peoria Malleable Castings Co., Peoria, Ill., and E. J. Stockum, Dayton Malleable Iron Co., Dayton,

FRANK G. STEINEBACH
Elected FEF president



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FEF vice president

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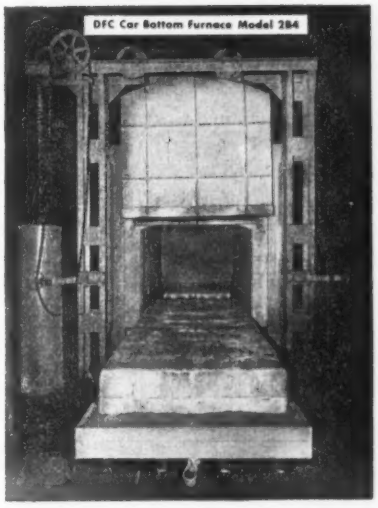
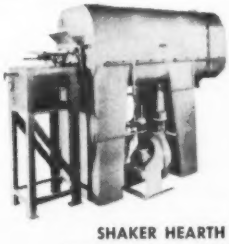
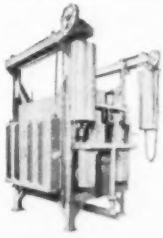




SHAKER HEARTH
HEAT TREATING FURNACE



BOX TYPE
HEAT TREATING FURNACE

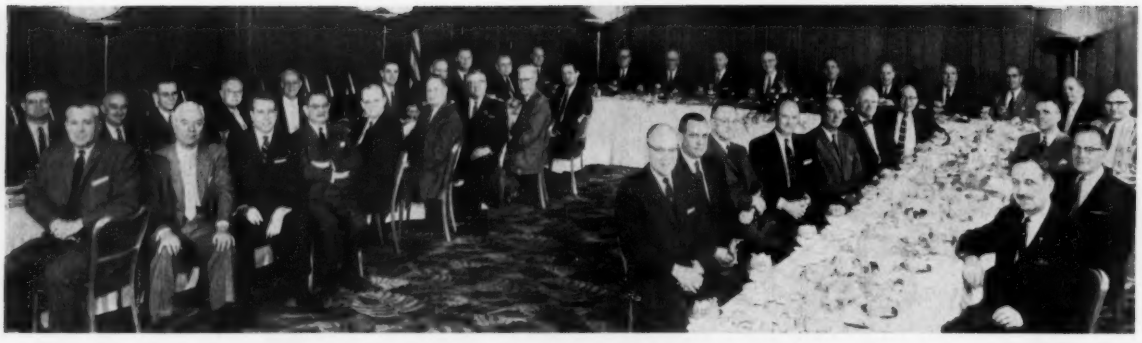
SEMI-MUFFLE TYPE
HEAT TREATING FURNACE

Denver Fire Clay Company

DENVER • SALT LAKE CITY • EL PASO

DF 9-7

Circle 625 on Page 53



Annual FEF alumni banquet brings together present and past officers and trustees

Ohio, to fill an unexpired term; Non-Ferrous Founders' Society — W. A. Gluntz, Gluntz Brass & Aluminum Foundry Co., Cleveland; and Steel Founders' Society of America—J. L. Worrilow, Lebanon Steel Foundry Co., Lebanon, Pa.

In opening the general meeting, Mr. Bujold stated that the purpose of the meeting was the exchange of ideas between foundrymen, educators, and design engineers attending. To that end, conference sessions were planned to provide interesting facts on foundry techniques as they affect design of cast parts.

An Introduction to Casting Processes and Casting Properties, by Hans J. Heine, Malleable Founders' Society, Cleveland. Cast parts often are considered as substitutes for parts made by other methods. This conveys the erroneous impression that castings are inferior. In reality, castings offer the greatest possible variety of engineering design opportunities and metallurgical properties.

Their advantages include: No limitation on size, shape, or intricacy; cast to size and shape with close tolerances and good finish, reducing the amount of machining required; mechanical properties the same as those of wrought metals if chemical composition and heat treatment are the same, plus the advantage of having these same properties in all directions; dimensional stability; design flexibility because metal can be added where it is needed and reduced where it it not needed; a wide selection of molding methods and alloys to satisfy requirements for producing a serviceable part, and cost saving through mass production.

Directional Solidification as Related to Design, by Willard P. Dudley, Ohio Steel Foundry Co., Springfield, Ohio. Colored slides depicted metal solidification patterns as related to section shape. Sections tapered away from the feeding end freeze solid. The tapered effect can be achieved in straight sections by use of chills. Generally, the lighter the sections, the greater the degree of taper needed. In addition to casting soundness, tapering effect produces a metal with high stress resistance.

Section shape has more influence on casting soundness than feeding heads. However, heads do supply molten metal to solidifying castings and must be placed so that their feeding range is not exceeded.

Application of these principles to castings production at the speaker's foundry were illustrated. Also the use of brittle lacquer, strain gage, and photoelastic procedures for determining stress concentration in castings were discussed. Their application in determining good casting design and proper feeding techniques was explained.

Use of Stress Analysis in Casting Design, by Robert J. Franck, Superior Steel & Malleable Castings Co., Benton Harbor, Mich. Lack of understanding of the importance of shape is the biggest obstacle to good casting design. It stems from two main factors: 1. Most good designs can not be drawn on paper. 2. Because the education of most engineers is based on textbook and handbook data amassed from tests and design shapes restricted by fabricating processes other than casting, the minds of many engineers are closed to the newer concepts of shape and evaluation of test data.

Stress analysis is a basic tool for determining a design which will provide a part of maximum serviceability. Test bar data have no relationship to serviceability of a part. Such data can be used only for control over quality of melting processes.

Good design is based on a general streamlining of a part. Abrupt changes in section size with minimum radiuses and sharp corners concentrate stresses and reduce serviceability of a part. Several examples of good design were shown. In one case a part was reduced in weight from 235 to 145 lb, but load-carrying capacity was increased 205 per cent.

Section Design for Cast Metals, by John B. Caine, Cincinnati. Streamlining through proper blending of sections at their junctions is of prime importance in designing a part of good castability and with 100 to 200 per cent increased load-carrying capacity. Foundrymen should not cry on a designer's shoulder about castability of a design not intended for casting. Foundrymen should show a designer a castable shape which gives him better strength in a less expensive metal.

Discussion brought out that most casting failures result from poor design. Foundries need salesmen who will learn from a customer what the service requirement of a part is so that the best design to meet that requirement can be developed. Also, foundrymen should develop strength-design data and make them available to designers.

Design and Use of Castings in the Aircraft Industry, by Lowell H. McCreery, Tempco Aircraft Corp., Garland, Texas. A long history of

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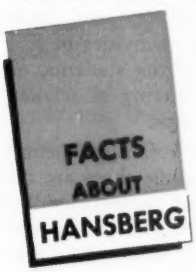

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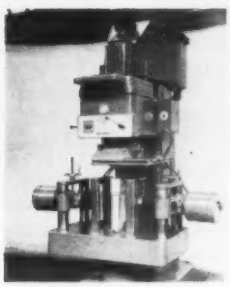
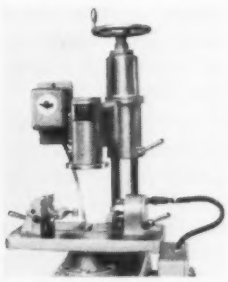
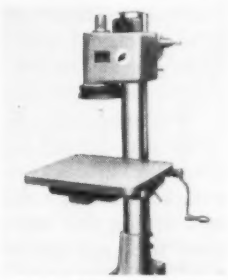


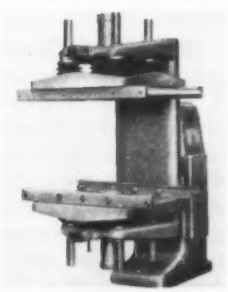
Core Shooter, CO-2 Hardener



Bench Model CO-2 Hardener



Floor Model CO-2 Hardener



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CO_2 MOLDING EQUIPMENT ALL IN ONE automatic CYCLE

Machine clamps flask, shoots mold, squeezes, CO_2-gasses, strips mold from pattern and automatically refills machine with sand all in one cycle. Adjustable CO_2-timer. Pattern mounted on machine, saves time wasting back and forth between machine and CO_2-gasser.

Shoots upright two molds at the time (see picture) or one mold with horizontal mounting of pattern. FAST CYCLE!

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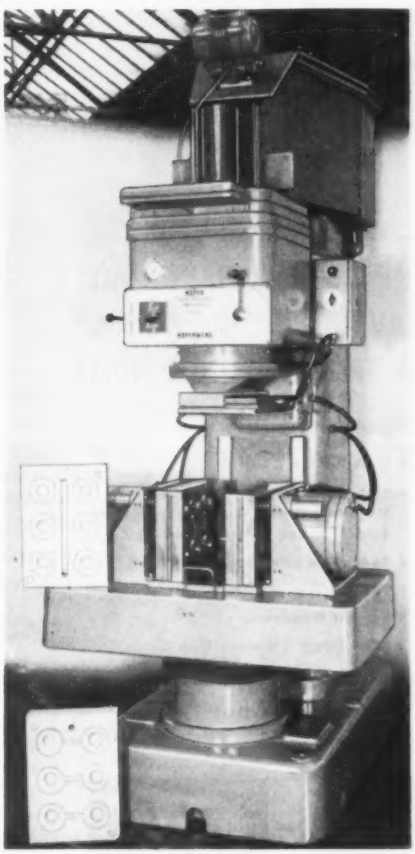

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incomplete co-operation between designers and foundrymen has created a feeling of distrust of castings in critical applications. To increase the use of castings in the aircraft industry, designers and foundrymen must maintain open minds and support any concept which appears to have a chance of dispelling the stalemate existing between the two groups. Designers must be convinced that good cast metal is reliable. Foundrymen might agree on how to cast a certain configuration and on what constitutes reasonable tolerances and quality levels.

The real key to extensive usage of castings in aircraft lies in foundrymen furnishing a finished, machined part. This concept gives foundrymen full latitude to produce a sound quality part meeting dimensional and weight requirements. It places full responsibility on the foundryman for making an acceptable part.

Three Dimensional Photoelasticity in Design, by Frederick J. Bogardus, Purdue University, Lafayette, Ind. The three dimensional photoelastic test technique shows stress inside as well as on the exterior of plastic models of parts. The technique involves the principle of temporary double refraction of the model under strain. When the strain is removed, stress patterns disappear. To facilitate study, stress patterns are locked in by heating the model, placing it under strain, and then holding the strain and letting the model cool. The model then can be sectioned without affecting the stress pattern and the pattern examined from different angles.

Case Histories of Government-Sponsored Castings Research, by Richard A. Flinn, University of Michigan, Ann Arbor. Government-sponsored research at universities provides an engineering basis for deciding on the use of a process or material, and those decisions open an avenue for further work in the field. Some universities, on the basis of research findings, have been successful in converting wrought parts to castings.

The foundry industry should try to get government money to conduct research if it is to keep pace with other industries.

Examples of Effective Co-operation Between Design Professors and the Foundry Industry, by Daniel K. Wright, Case Institute of Technology, Cleveland. Redesign of a one-piece, cast steel frame for a diecasting machine and development of designs for major castings in a new type railroad car coupling were described. Photoelastic test techniques were used in arriving at the best designs.

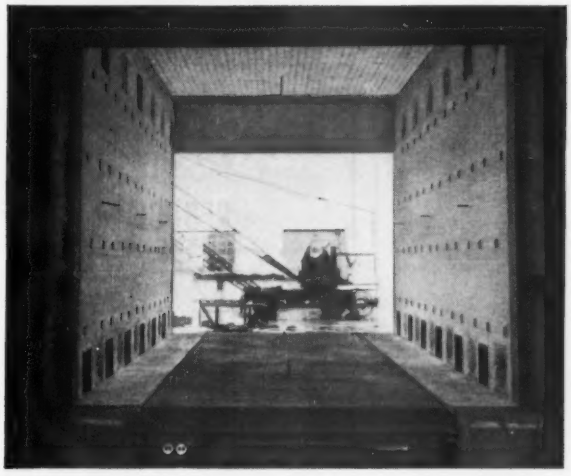
A four-member panel over which R. B. Parker, American Brake Shoe Co., New York, presided, discussed activities of FEF in areas of engineering education in cast metals, financial assistance to students, placement of students in industry, and industry advisory committees.

Panel members were M. C. Flemings, Massachusetts Institute of Technology, Cambridge, Mass.; D. S. Eppelsheimer, Missouri School of Mines, Rolla, Mo.; R. W. Heine, University of Wisconsin, Madison, Wis., and B. W. Niebel, Pennsylvania State University, State College, Pa.

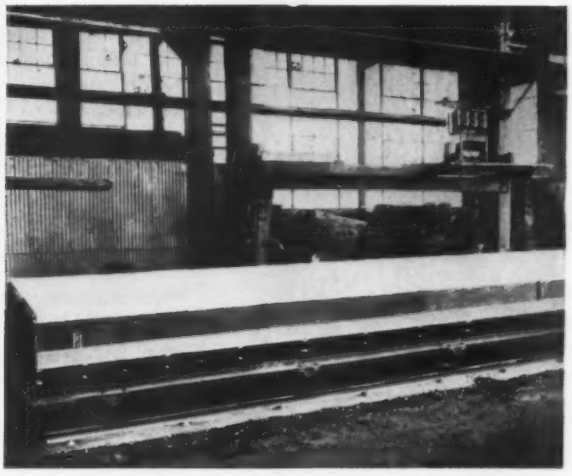
Build Enthusiasm—Prof. Flemings pointed out that foundry engineering courses at MIT essentially are for juniors and seniors, and are attended mainly by students in metallurgical engineering, with some mechanical engineering and business administration students. Since the foundry industry needs all kinds of engineers the courses range from the theoretical to the basic foundry engineering. Teaching staff endeavors at all times to inculcate an enthusiasm for cast metals.

Formal lectures are given on cast metals and cover various phases from heat flow to risering. Grading is by two examinations and a formal term paper on any subject. Instead of the formal term paper the student may select a recently established informal laboratory course in advanced work held only on Saturdays where he may engage in work of his choice. Prof. Flemings reported that activities of FEF are stimulating to the students, especially in the offering of scholarships and fellowships.

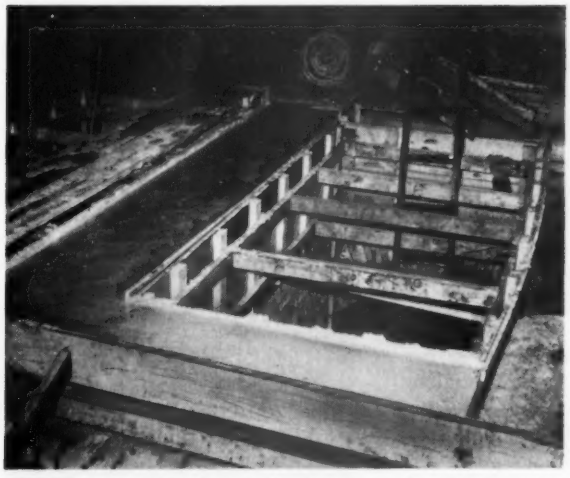
Student Aid—Prof. Eppelsheimer mentioned that while there are numerous sources of financial aid to students such as state scholarships, the GI bill, and co-op plans, the



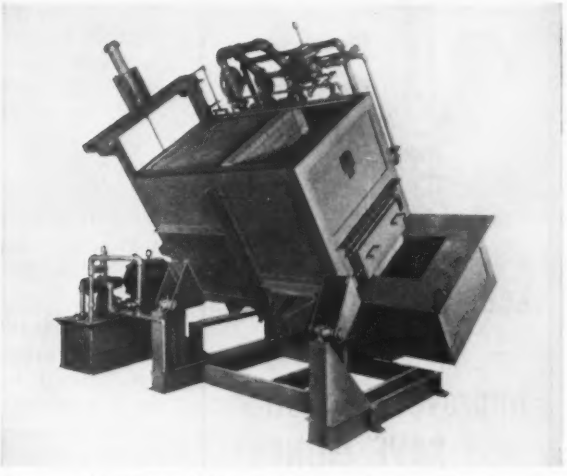
In this stress-relieving furnace, B&W Kaocrete-D is used on the floor ledges, car top, in the door jamb and at the end of the flat roof where it withstands the abrasion of the door. This material is specially designed to withstand severe abrasive conditions and mechanical abuse.



Heavy duty car top service requires a high strength castable. B&W Kaocrete-D is excellently suited for this service at temperatures to 2500 F. B&W Kaocrete-32 is recommended for service above this range.



B&W Kaocrete-32 has been cast to form the curb walls of a soaking pit. When mechanical abuse from ingots damages the curb, Kaocrete-32 has the necessary properties to localize the damage, thus maintaining the serviceability of the rest of the curb.



The castable lining of this aluminum reverberatory furnace must have unusually high strength to withstand the considerable physical abuse of charging, operating and cleaning, while resisting the penetration of the molten metal. Kaocrete-D is widely used in this application.

How B&W refractory castables solve abrasion problems

Refractory castable linings used in metal-working furnaces are often subjected to severe mechanical abuse. Scraping by hand tools, loading and unloading, and the action of the molten metal and particle-laden gases all affect the life of refractories. Among B&W's line of refractory castables are two that are particularly suited to withstand unusual abrasive conditions. They are B&W Kaocrete-D and B&W Kaocrete-32, both of which have been used successfully in many demanding applications.

Send for a copy of B&W Bulletin R-35A. It gives additional information on versatile B&W refractory castables.

R606

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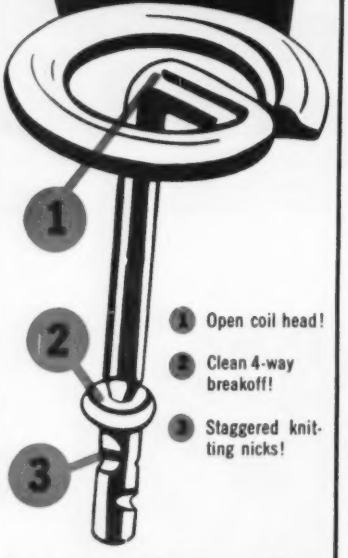

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FEF is unique in that the foundry industry recognizes the possibilities in aiding students, and thus speaks with authority in engaging their interest.

Students to receive scholarships are selected by a faculty committee which considers their activities in the field, ability, and financial need. Scholarships are granted on a semester basis during the junior and senior years, although in exceptional cases they may be given to sophomores and rarely to freshmen. Scholarship students are presented with certificates at a public ceremony on completion of courses to focus attention on the student and FEF.

Students in Industry—Summer employment of engineering students in foundries is a two-way street, according to Prof. Heine. It aids the students in making decisions on whether to continue in the field, and gives foundries the opportunity to determine the students' capabilities. The handling of students is important in forming their attitudes toward industry. As the student progresses from his freshman to senior year, he should be advanced from routine foundry operations to those where he has some responsibility.

After graduation the student must be given opportunity for professional growth by moving him along the line to supervisory and eventually to management positions. Prof. Heine said that students are encouraged by visits of the FEF advisory committee, activities of the student foundry chapter, and interest of the industry.

Committee Work—Industry committees fulfill an important function, according to Prof. Niebel. At Pennsylvania State the FEF committee meets twice a year to discuss the educational program, meets with the students and instructors, advises on summer and permanent employment, and aids in obtaining additional equipment. To participate in the FEF, students must choose six electives in the foundry field. It is believed that this limits the benefits to those with a real interest in the castings field.

European Practice—James L. Leach, University of Illinois, Urbana, Ill., spoke on his visit to a number of schools in Europe last

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summer. Most of those schools conduct foundry courses, and he said that the facilities and instruction are good but not superior to those in this country.

New York University Offers Course on Ductile Iron

A one-week program on ductile iron technology will be offered June 29-July 3 at the University Heights campus of New York University, in the Bronx. It will consist of 25 lectures and discussions on the latest developments in the field. Informal evening discussions also will be held.

D. J. Reese, director, Ductile Iron Div., International Nickel Co. will deliver the keynote address. Also speaking at the first session will be Dr. John R. Ragazzini, dean, College of Engineering, NYU; Dr. Harold K. Work, director of the college's Research Division; Dr. John P. Nielsen, chairman of the college's department of metallurgical engineering; and Dr. Rointan F. Bunshah, program chairman and associate research scientist at the college.

Speakers and their subjects include the following:

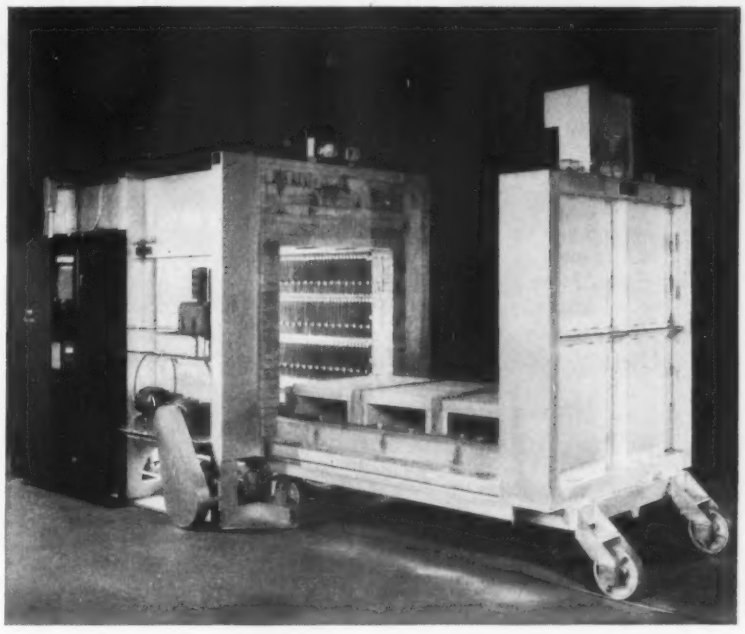
Rointan F. Bunshah, NYU, "Iron-Carbon Diagram and Steels"; John P. Nielsen, NYU, "Cast Irons and Malleable Irons"; K. D. Millis, International Nickel Co., "Metallurgy of Magnesium-Containing Iron"; H. Morrogh, British Cast Iron Research Association, "Theoretical Considerations of Spheroidal Graphite Formation"; R. A. Flinn, University of Michigan, "Engineering Properties of Ductile Iron"; C. R. Isleib, Inco, "Mechanical Properties of Ductile Iron"; J. L. Salbaing, Inco, "Machinability and Welding Characteristics."

Howard F. Taylor, Massachusetts Institute of Technology, "Effect of Alloying on Properties and Matrix Structures"; Charles C. Reynolds Dartmouth College, "Effect of Heat Treatment on Properties and Structure"; W. W. Braidwood, Mond Nickel Co., "Melting Methods and Procedures"; R. W. White, Inco, "Methods of Magnesium Treatment and Inoculation"; a representative of Morris Bean & Co., "Precision Molding of Ductile Iron"; A. A. Adams, Ford Motor Co., "Quality Control and Testing"; Harry W. McQuaid, consultant, "Hot Working of Ductile Iron"; J. L. Salbaing, Inco "Designing for Ductile Iron."

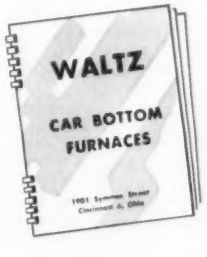
H. W. Northrup, Inco, "Specifications and Codes"; a representative of International Harvester Co., "Applications in Farm Equipment"; K. H Kurgin, Inco, "Applications in Fluid Handling Equipment"; Garrett D. Orr, Hodge Foundry Co., "Applications in Steel Mill Maintenance"; W. H. Dawson, Inco, "Applications in the Automotive Industry"; E. Mortara, Bologna, Italy, "Applications in Europe, Africa, and the Far East"; and F. G. Sefing, Inco, "Properties and Applications of Ductile Ni-Resist."

There also will be lectures on ductile iron sand molding and shell molding and applications in gear and power machinery. Speakers for these talks will be announced later. Further information can be obtained by writing to M. Berk, Department of Metallurgical Engineering, New York University College of Engineering, University Heights, New York 53, N. Y.

LOOK . . . no rails needed and installation costs cut when you buy this new Waltz furnace



This new WALTZ electric car bottom furnace, 3' wide x 3' high x 6' long, completely eliminates expensive installation of rails, etc. It is in wide usage in plants where heat treating facilities are above the first floor. Rigid and sturdy construction gives years of usage. Ball bearing wheels for easy operation. Furnace has 12" lining of insulation, heating elements on side walls, rear wall, door, and top of car. Many other typical Waltz features make this special car bottom furnace a wise investment. All technical details, etc., are included in an illustrated 33 page book available free on request.



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DRAGOON PLASTIC (wet) comes in convenient, ready-to-use slices for hand or air hammer ramming. Forms a solid monolithic lining in wells, ladles and spouts that will not shrink, crack or erode out. Reduces lining repair . . . promotes cleaner equipment . . . cleaner metal.

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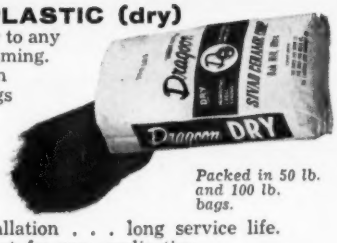
DRAGOON PLASTIC (dry) is mixed with water to any consistency for ramming. It can be rammed in against safety linings to form a solid refractory structure that will not shrink away or spall. It reduces maintenance costs through easy installation . . . long service life. It's an ideal product for gun application.



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DRAGOON CARBON CUPOLA BLOCK outlasts other refractory block 5 to 1. This exclusively formulated, carbon-fortified block will give superior service in cupola wells, spouts and ladle linings. Heat of the molten metal forms a fused surface on the hot face of the block, entrapping the carbon and preventing oxidation. This tough shell resists slagging, abrasion and penetration, yet allows carbon to come through lubricating each heat. The result is extended service life . . . cleaner, easier casting.

Available in all standard cupola blocks and special sizes.

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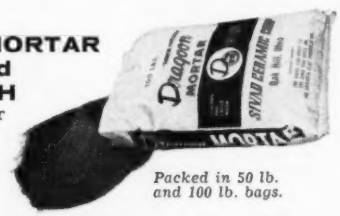

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Industry Briefs

● **WHITIN MACHINE WORKS**, Whitinsville, Mass., has arranged to purchase American Type Founders Co., Elizabeth, N. J. ATF will continue to do business under its present name.

General Electric has transferred its Chemical & Metallurgical Div. headquarters from Pittsfield, Mass., to Bridgeport, Conn., and has expanded it by the addition of several departments from the former Construction Materials Div.

F. E. (North America) Ltd., Toronto, Ont., Canada, has appointed the following United States representatives: Snyder Foundry Supply Co., 2444 E. 57th St., Los Angeles, Calif., for California, Nevada, Utah, New Mexico, and Arizona; C. W. Ammen, 527 Camp Ave., Gulfport, Miss., for Texas, Louisiana, Mississippi, Alabama, Mexico, and Colombia; Foundry Supply Co., Minneapolis, for Saskatchewan, Manitoba, North and South Dakota, Nebraska, Iowa, and Minnesota; and LaGrand Industrial Supply Co., Portland, Oreg., for Oregon.

Findlay Refractories Co., Findlay, Ohio, has been purchased by Standard Coal Co., also of Findlay, and will be operated as a division. The refractories division will be reorganized to serve users in a larger area.

Metal Treating Institute reports billings by its members during February of $2,976,000, or 20.7 per cent more than a year ago.

Hitchiner Mfg. Co., Milford, N. H., investment caster, has acquired all assets of Permattach Diamond Tool Co., also of Milford, and will operate it as a wholly owned subsidiary.

Air Equipment Co., 1-A Lincoln Ave., Albany, N. Y., has been formed as the result of a merger of two former New York state representatives of American Air Filter Co., Louisville, and will represent AAF in upstate New York.

American Railway Car Institute states that 1806 new freight cars were ordered during February, compared with 4007 in January and 287 a year ago.

Oswald Refractories Co. has moved to larger quarters in the Brentwood Bank Building, 1401 S. Brentwood Blvd., St. Louis 17, Mo.

Coles Cranes Inc., Joliet, Ill., has appointed Rapistan Inc. of New York, 2548 Elmwood Ave., Buffalo 17, N. Y., to be its sales and service representative for the Buffalo-Rochester area.

States Engineering Corp. has moved its general offices to larger quarters at 245 E. Murray St., Fort Wayne, Ind.

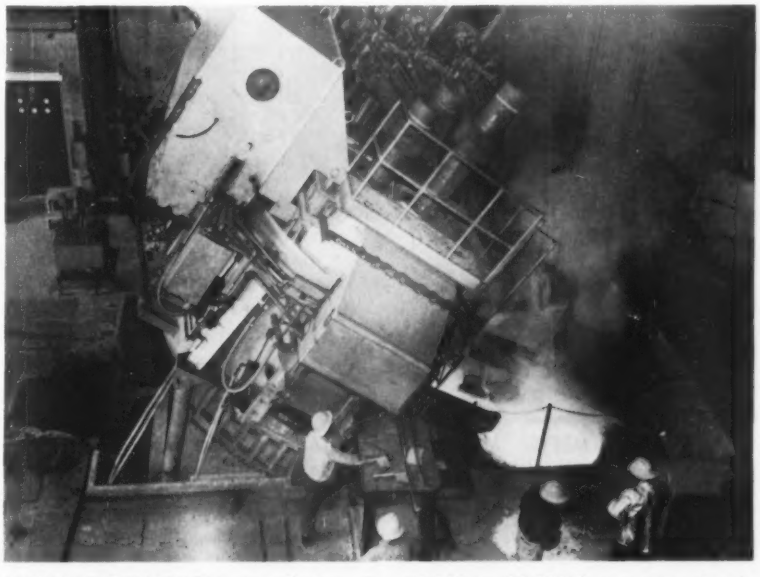
Richmond Materials Handling Co., sales and service representative for Yale industrial trucks and tractor shovels in Virginia, has moved to 2303 Westwood Ave., Richmond, Va. Terry A. Hurlbut Jr. has been named general manager.

Bohn Aluminum & Brass Corp., Detroit, has opened a new district sales office in Grand Rapids, Mich. Lawrence K. Moore is district manager.

Bay State Abrasive Products Co., Westboro, Mass., has opened a new branch office and warehouse at 9559 Granger Rd., Cleveland 25, Ohio. Telephone is LUdlow 7-1484.

King Graphite Products Inc., 21949 S. Telegraph Rd., Trenton, Mich., is a new corporation producing graphite lubricating products. John L. King is president.

Industrial Heating Equipment Association Inc. reports that net new orders for industrial furnaces during January and February totaled



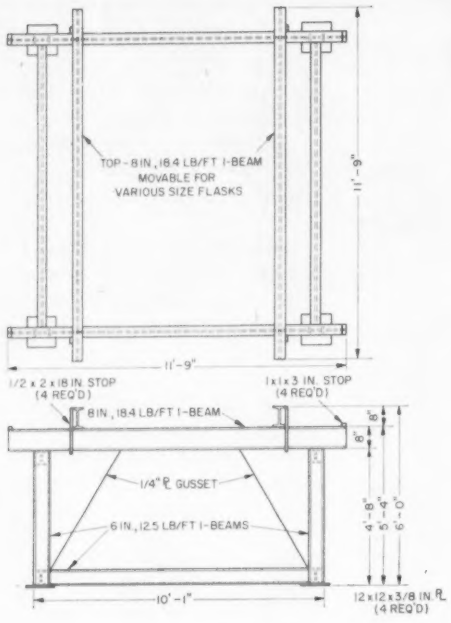
FURNACE EXPANSION: Installation of a 12,000 to 30,000-lb capacity electric furnace at Standard Steel Works Div., Baldwin-Lima-Hamilton Corp., Burnham, Pa., now permits Standard to make and process a variety of specialty steels, including steel for alloy casting. In addition, the division installed seven heat treating furnaces and three ingot cooling furnaces

HOW To Do It

FOUNDRY will pay a minimum of $15 for each "How To Do It" idea submitted and published

Flask Rack Holds Half Molds for Tieing Cores, Patching, or Drying

By LOUIS MOZES
Bridgeport, Conn.



ADJUSTABLE flask rack will hold filled flasks ranging in size up to 140 x 200 in. for patching, core tieing or bolting, or skin drying operations. For core tieing or bolting work, cores are set in the cope while it rests on the floor. Then it is hoisted and set on the rack, face up. For patching or skin drying work, the half mold is set face down on the rack.

Use of the rack frees a crane for other work while these operations are performed. As shown by dimensions on the drawing, the rack is high enough to permit workers to stand under the mold to perform the tieing, patching, or skin drying work.

$6,260,000, or 7 per cent below orders for the same period in 1958. In the same months, orders for induction equipment increased to $2,151,000, or 112 per cent.

Brush Beryllium Co., Cleveland, has appointed W. T. Peterson Co., Detroit, as sales representative for Michigan, northern Indiana, and northern Ohio.

NFA COUNCIL MEETS: Members of the Administrative Council, National Foundry Association, met in Washington recently. The program included a business meeting at which 12 companies were accepted as members, a reception and dinner attended by 11 Congressmen, and a luncheon at which Secretary of Labor James P. Mitchell was present. Seated at the luncheon, clockwise, are W. W. C. Ball, C. A. Carolin, Martin J. Ewald, John Emery, James P. Keating, David Drewery, W. G. Greenlee, R. C. S. Potter, Secretary Mitchell, Arthur G. Hall, C. T. Sheehan, Warren Brown, Robert Scott, John Meyer, John C. Meyers Jr., and William J. Bulman. Standing, from left to right, are A. Lysle Dyer, Chester V. Nass, E. C. Thompson, Curtis Hasty Jr., J. F. Campbell, and C. R. Heller, Foundry Equipment Manufacturers Association

Book Review

Introduction to Foundry Technology **by D. C. Ekey and W. P. Winter, cloth, 296 pages, 6 x 9 in., published by McGraw-Hill Book Co. Inc., 330 West 42nd St., New York 36. Price $7.**

Intended to acquaint the engineering student with the basic concepts of foundry technology, this book employs a different approach. The work is presented in abbreviated outline to permit comprehensive coverage of subject matter in the minimum time, and is an advanced version of a foundry-course manual developed and used by the authors at Pennsylvania State University.

Divided into two sections, the first is a series of lectures on the theoretical aspects of foundry technology to provide the engineer with information on the applications and limitations of casting processes. Second section is a practical one, supplying operational data on methods of foundry procedures and processes. These data are integrated roughly with the lecture series. This section provides operation sheets, giving in outline form the step by step procedure.

Circle 634 on Page 53→

Knight professional foundry engineering

The key men in the Knight organization have from 10 to 25 or more years of successful experience in some phase of foundry management, production, engineering or equipment. The coordination of each man's specialized experience, plus a realistic "working type" approach, enables the Knight organization to supply foundry management with reliable, practical assistance on virtually all foundry problems. The Knight organization has successfully completed more than 400 assignments in every type of foundry —grey iron, steel, malleable, brass and bronze, magnesium, and aluminum. These foundries are producing castings from a few ounces to 50 tons and from 1 to more than 1,500 tons of castings per day. Green sand, dry sand, cement, plaster, "shell" molds, permanent mold, centrifugal, die casting and investment casting operations all have been served by Knight.

Working closely with clients' staffs, Knight Engineers have assisted clients to audit operations, improve organization and management, establish cost and incentive systems, modernize methods and facilities, and design complete new plants, with economically sound mechanization and automation in varying degree. Knight is working with the most modern foundries in the United States, Canada, Europe and South America and is staffed to do a "turnkey" job.

Knight Engineering

From the solution of a single problem in one department . . .

The Knight engineering organization, with successful experience in more than 400 foundry assignments here and abroad, is equipped to assist managements with a wide range of foundry problems. In many instances, Knight has assisted the client to modernize methods and facilities, then established the new organization and procedures for adequate control (including cost control), and new incentives based on the work content of the job.

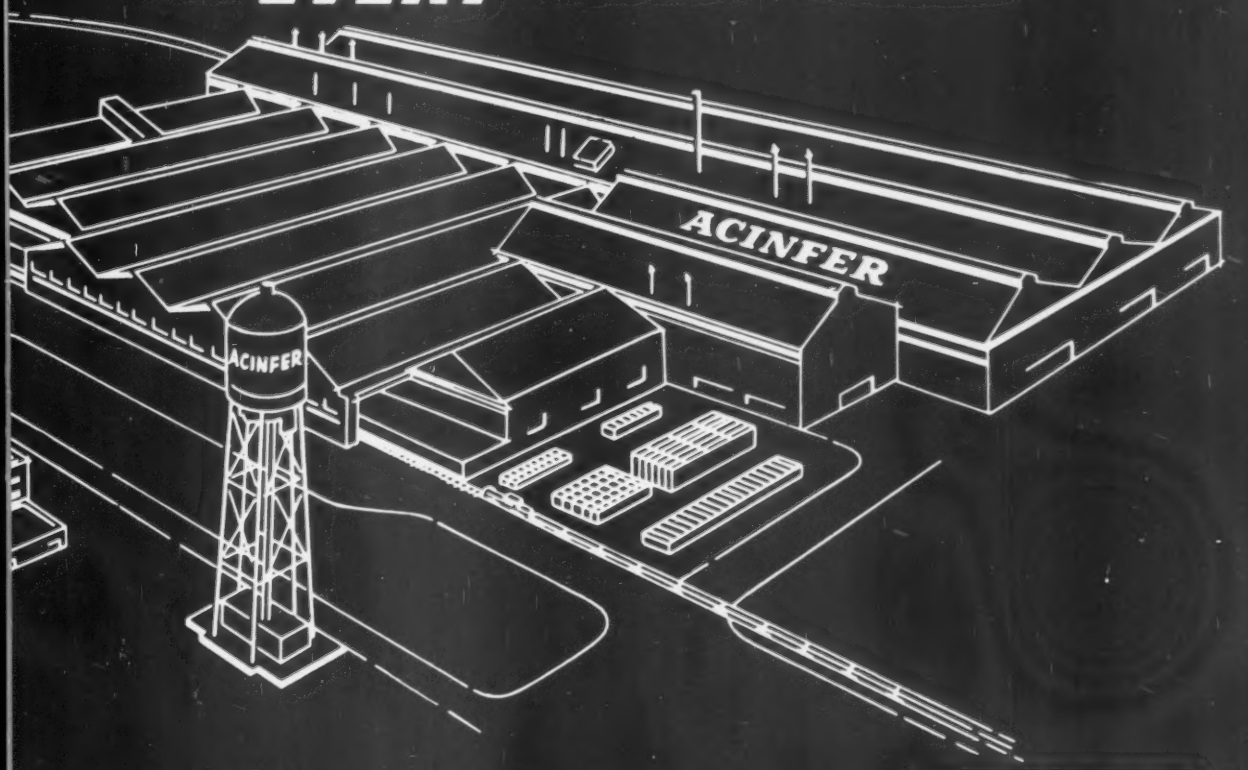
Lester B. Knight & Associates, Inc.

MANAGEMENT, INDUSTRIAL AND PLANT ENGINEERS

Member of the Association of Consulting Management Engineers, Inc.

Experience is available

...FOR *EVERY* FOUNDRY PROBLEM



The Acinfer, S.A. plant, engineered by Knight, was awarded a Diploma of Honour by McGraw-Hill's "Ingenieria International Industria" as the most modern industrial plant in the Argentine Republic.

KNIGHT SERVICES INCLUDE:

Foundry Engineering
Architectural Engineering
Construction Management
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Cost Control
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Production Control
Modernization
Mechanization
Methods
Materials Handling
Automation
Survey of Facilities
Marketing

. . . to the design, layout and construction management of complete new plants

For others, as in the case of Acinfer, the largest grey and malleable iron foundry in South America, Knight Engineers had overall responsibility from planning to successful operation. This comprehensive assignment involved basic designing, specification, procurement and supervision of installation of facilities, procurement and supervision of operating personnel. Similar broad foundry assignments have been carried out in the United States, Canada and Europe.

549 W. Randolph St., Chicago 6, Ill. • 917 Fifteenth St., N. W. Washington D.C. • New York Office—Lester B. Knight & Associates, 375 Fifth Ave., New York City 16 • Knight Engineering Establishment (Vaduz), Zurich Branch, Bahnhofstrasse 17, Zurich, Switzerland • Lester B. Knight & Associates, G.M.B.H., Berliner Allee 47, Düsseldorf, Germany

A partial list of

Knight clients

for professional

foundry engineering

- **Acindar, S.A.**
  Buenos Aires, Argentina
- **Acinfer, S.A.**
  Villa Constitucion, Argentina
- **Alloy Steel Products Co.**
  Linden, N. J.
- **American Brake Shoe Company**
  Chicago and St. Louis
  Buffalo and New York
- **American Malleable Castings Company**
  Marion, Ohio
- **American Radiator & Standard Sanitary Corp.**
  Baltimore and Louisville
- **Appleton Electric Company**
  South Milwaukee, Wisc.
- **Belle City Malleable Iron Company**
  Racine, Wisc.
- **Bergische Stahlwerke A.G.**
  Remscheid, Germany
- **Buckeye Steel Foundry Co.**
  Columbus, Ohio
- **Buderus 'sche Eisenwerke**
  Essen, Germany
- **Canadian Car and Foundry Company, Ltd.**
  Montreal, Quebec
- **Chrysler Corp.**
  New Orleans, La.
- **C. K. D.**
  Blansko, Czechoslovakia
- **James B. Clow & Sons Co.**
  Birmingham, Ala.
- **Combustion Engineering, Inc.**
  Chattanooga, Tenn.
- **Crane Co.**
  Chicago and Chattanooga
- **Dalton Foundries, Inc.**
  Warsaw, Ind.
- **Dayton Malleable Iron Co. (3 plants)**
  Dayton, O.
- **Der Stahl- und Temperguss A. G.**
  Traisen, Austria
- **Dominion Foundries & Steel Limited**
  Hamilton, Ontario
- **Electric Steel Foundry Company**
  Portland, Ore.
- **Erie Malleable Iron Company**
  Erie, Pa.
- **Fahralloy Canada Limited**
  Orillia, Ontario
- **Fairbanks, Morse & Co.**
  Kansas City, Kan.
- **Federal Malleable Co.**
  Milwaukee, Wisc.
- **General Railway Signal Company**
  Rochester, New York
- **General Steel Castings Corp.**
  Eddystone, Pa.
- **Goetzewerke A/G**
  Burscheid, Germany
- **Gunite Foundries Corporation**
  Rockford, Ill.
- **Hammond Brass Works**
  Hammond, Ind.
- **Hauts-Fourneaux et Fonderies**
  Halbergerhutte
  Brebach (Sarre), Germany
- **Haynes Stellite Company**
  Kokomo, Ind.
- **Hershey Corporation**
  Havana, Cuba
- **A. Y. McDonald Manufacturing Company**
  Dubuque, Iowa
- **Mannesmann-Meer A.G.**
  Munchen, Gladbach, Germany
- **Moline Malleable Iron Company**
  St. Charles, Ill.
- **Mueller Co.**
  Decatur, Ill.
- **National Roll & Steel Foundry Co.**
  Avonmore, Pa.
- **Ohio Injector Co.**
  Wadsworth, Ohio
- **OPW Corporation**
  Cincinnati, Ohio
- **Pittsburgh Steel Foundry Corporation**
  Glassport, Pa.
- **Ransohoff, Inc.**
  Hamilton, Ohio
- **Scullin Steel Company**
  St. Louis, Missouri
- **Sibley Machine & Foundry Corporation**
  South Bend, Ind.
- **Spojene Tovarny Na Obrabeci Stroje**
  Brno, Czechoslovakia
- **Stavanger Electro-Staalverk A/S**
  Jorpeland, Norway
- **Stockey & Schmitz**
  Gevelsberg, Germany
- **Stockham Valves & Fittings**
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- **Sulzer Bros. Ltd.**
  Winterthur, Switzerland
- **Superior Steel & Malleable Castings Co.**
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- **Universal Castings Corporation**
  Chicago, Ill.
- **Wagner Malleable Iron Company**
  Decatur, Ill.
- **Walworth Company**
  Kewanee, Ill. and Boston, Mass.
- **Wellman Bronze & Aluminum Company**
  Cleveland, Ohio
- **Woodruff & Edwards, Inc.**
  Elgin, Ill.
- **Worthington Corporation**
  Harrison, N. J.

PENN STATE PROGRAM IS SHAPING UP

Conference Will Stress Operating Practice

● FINAL arrangements are shaping up for the second biennial Penn State Foundry Conference, to be held June 25-27 at Pennsylvania State University, University Park, State College, Pa.

Technical sessions will cover sand, gray iron, steel, malleable iron, and nonferrous alloys. Dr. Eric A. Walker, president, Pennsylvania State University, will be the featured speaker at a luncheon on the first day of the meeting.

The program will include registration on Thursday morning, June 25, a luncheon that day, and technical sessions in the afternoon. A picnic and mixer will be held that night. Friday will be devoted to technical sessions, with a dinner in the evening at which Frank G. Steinebach, editor, FOUNDRY, will be speaker. Technical sessions on Saturday morning will conclude the conference.

The program is not yet complete, but speakers at technical sessions will include the following:

"Occurrence, Production, and Uses of Quality Silica," L. G. Burwinkel Jr., Pittsburgh Glass Sand Corp.; "Sand Segregation," W. D. Chadwick, Manly Sand Corp.; "Cold Curing Type Binders," Frank H. Dettore, G. E. Smith Inc.; "Moldable Exothermic Materials," John E. Gotheridge, Foundry Services Inc.; M. J. Kellner, Westinghouse Electric Corp. (gray iron, topic to be selected); "Economical Founding of Ductile Iron Castings," C. W. Gilchrist, Cooper-Bessemer Corp.; "Gating of Gray Iron Castings," John F. Wallace, Case Institute of Technology.

"Utility of Sand Binder 230 in Steel Foundry Molding Sands," John L. Dewey, Dow Chemical Co.; "Ferroalloys—Production, Uses, and Future Trends," E. R. Saunders, Union Carbide Metals Co.; "Deoxidation Practice in Steel Foundries," John N. Ludwig Jr., International Nickel Co.; "Isotopes in the Radiography of Steel Castings," Mark Rosumny, Picker X-Ray Corp.; "Cupola Refractories," Thomas E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp.; "The Use of Alloys in Gray Iron Melting," Ralph Clark, Union Carbide Metals Co.

"Oxygen in Malleable Furnace Practice," J. B. La Pota, National Cylinder Gas Co.; "Elevated Temperature Properties of Malleable Iron," Dr. Lauriston C. Marshall, Link-Belt Co.; "Pearlitic Malleable as an Engineering Material," Carl F. Joseph, Central Foundry Div., General Motors Corp.; "Malleable Gating and Design," Richards E. Rosien, Eastern Malleable Iron Co.

Participants in a panel discussion on sand will be Henry W. Meyer, General Steel Castings Corp.; Larson Wyle, Pangborn Corp.; Thomas C. Jester, Darling Valve & Mfg. Co.; John Fuqua and Joseph Lessman, Cooper Alloy Corp.; and Paul W. Green, General Electric Co.

Speakers at nonferrous sessions will include A. R. Barbour, Roessing Bronze Co.; Ray Cochran, R. Lavin & Sons; C. E. Coulter, Archer-Daniels-Midland Co.; Eugene Belkin, Westinghouse Electric Corp.; and J. H. Dunn, Aluminum Co. of America.

Fee for the conference is $15, which includes registration, instructional materials, one luncheon, a picnic, and the dinner. Some accommodations are available in a university residence hall, and hotel and motel accommodations also can be secured. For any further information, write to W. P. Winter, conference secretary, College of Engineering and Architecture, Pennsylvania State University, University Park, Pa.

"I've had enough of your smart stuff about our old equipment"

Ideal for Classifying Foundry Sands

The CONCENCO® CPC Classifier sorts either new or used foundry sands into sharply defined sizes . . . one size for each cell built into the classifier.

It operates by hydraulic water only. There are no moving parts. Classification is sharp, fast and economical. Action is visible, permitting easy adjustment of hydraulic water for best results.

The SuperDuty® Table Recovers Valuable Metallics from Foundry Wastes

By washing foundry residues, machine shop wastes and floor sweepings over pooled riffles, the SuperDuty table recovers valuable metallics, even when present in slime sizes. Many foundrymen say the SuperDuty table more than pays for itself every year. Send for Bulletin 118-C.

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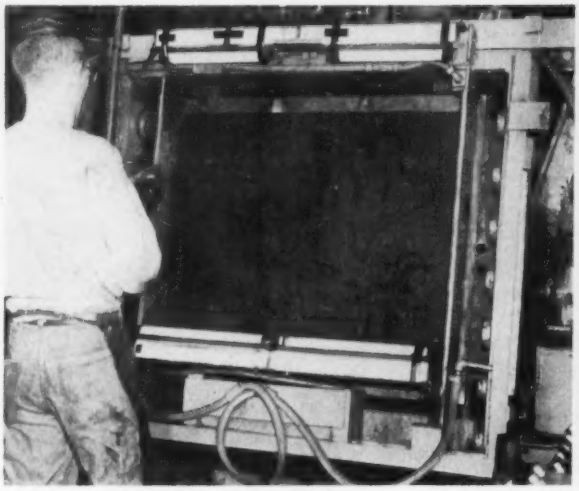
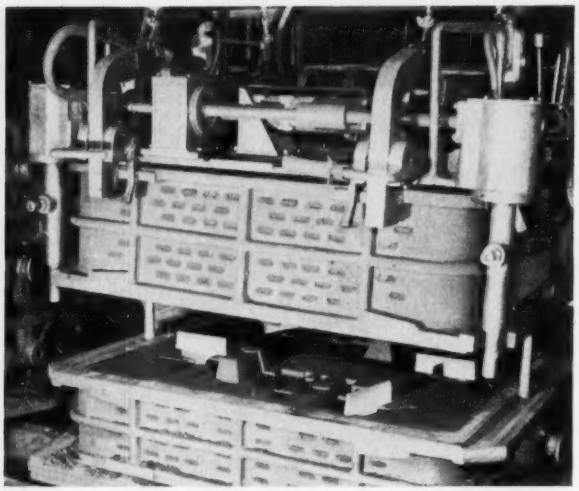


Completely automatic jolt, squeeze, and strip machines are used to make full 1200-lb green sand molds. Operator here inspects completed cope mold



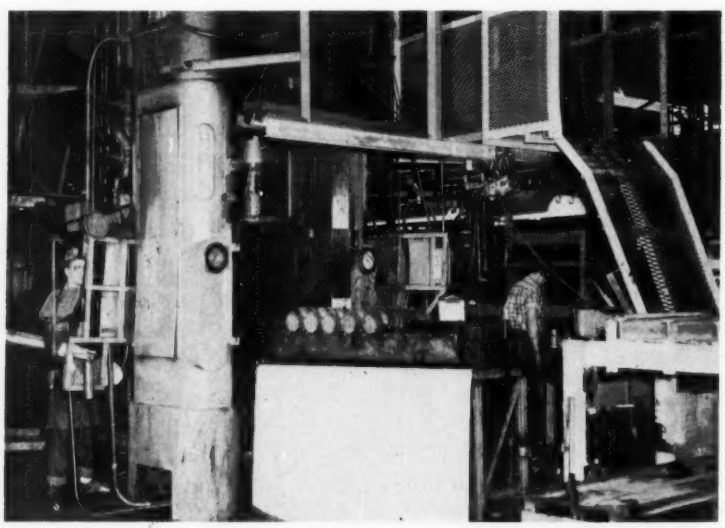
Drag half of crankshaft mold rests on a conveyor plate with slag cores in position. A motor fixture keeps cope level with drag as mold is closed

Automotive Crankshafts Cast in Green Sand

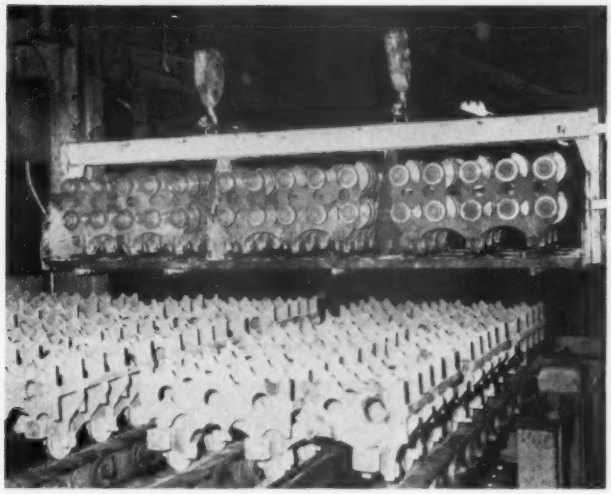
● CENTRAL FOUNDRY DIV., General Motors Corp., is supplying crankshafts cast in green sand molds for all 1959 Pontiac passenger car engines. They are produced at the Danville, Ill., foundry.

The parts are made of a special type of Central Foundry's pearlitic malleable iron—ArmaSteel—developed specifically for crankshafts.

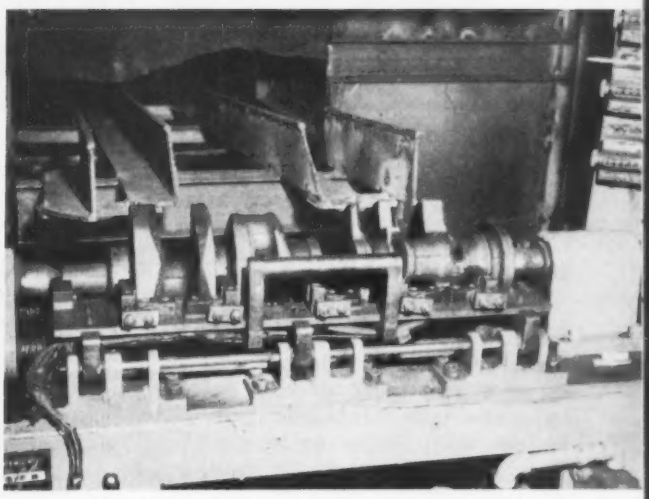
In 1956, Central Foundry produced the first cast crankshaft to be used in regular production by a General Motors car division. This



After draw operation, castings are removed from annealing cradles and unloaded into this hydraulic press. They are fed automatically into the straightening fixture, pressed, then rolled 90 deg, pressed again, and ejected.



Sprue, bobs, and runners are removed from cooled castings, which are placed in alloy cradles. They subsequently are annealed, air quenched, and drawn



Each crankshaft is checked for surface imperfections in a Magnaglo inspection booth, then gaged for straightness and location of counterweights

original crankshaft, designed for lower horsepower engines, was cast in shell molds because, the company explains, green sand molding technology at that time was not capable of making such a casting.

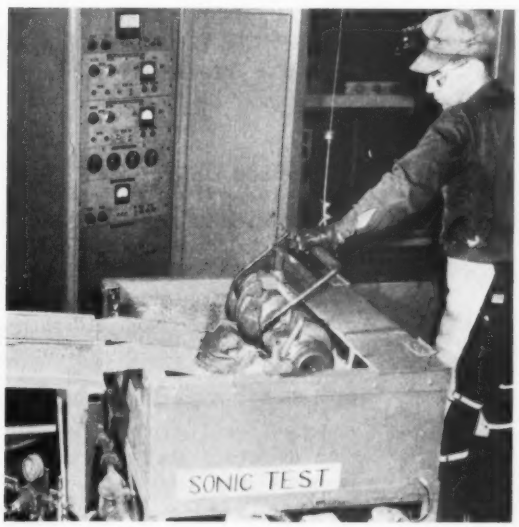
Production of the larger, stronger crankshafts without a corresponding increase in cost has been accomplished by a series of improvements in green sand molding practice which includes newer, automatic molding machines, special molding sands, and a more efficient sand control system. Continuous and accurate measurement of moisture content is a factor in achieving close sand control.

The cast crankshaft offers several advantages over the forged steel type. It is much easier to machine, and less machining is required because it is closer to finished dimensions than the forged product. In addition, the casting process permits counterweight shapes and spacings not attainable in a forging.

For crankshaft purposes, the basic white iron is inoculated with small amounts of two alloy additives patented by General Motors Research Laboratories. These additives prevent the formation of primary graphite and decrease the length of time required for heat treatment.

Central Foundry has supplied crankshafts for approximately one million Pontiac vehicles. Their performance has been excellent in every respect, says James H. Smith, general manager of the division.

In sonic test chamber, castings are struck automatically with a metal hammer. Frequency of the resulting tone is compared with established standard



Sound also is used in this test. Crankshafts are immersed in water, in which they are probed internally by ultrasonic beams for any hidden flaws

Foundry Developments

By EDWIN BREMER
Metallurgical Editor

Lime Bonds Sand

NEW CO_2 process developed in Sweden employs lime and a cellulose derivative instead of sodium silicate as the binding agent, according to an article, "Kalk-CO_2 Metoden," by Rolf Moren in the January issue of *Gjuteriet* (Stockholm). In the process about 4 per cent dry slaked lime and about 1 per cent ethyl-hydroxyethyl cellulose is added to dry or nearly dry sand low in clay and silt, and then small amounts of water are added to give a final moisture range of 2 to 4 per cent. Blending or mixing time is from 2 to 6 minutes.

The mixture is reported to have moderate green strength, good dry strength, low gas content, and low retained strength. Material is gassed with CO_2 at a pressure of around 30 psi.

Electronic Bombardment

ELECTRON-BEAM equipment now is being used to join reactive and high-melting-point metals used extensively in critical missile and atomic reactor applications. It was designed and constructed by Central Research Laboratories, Air Reduction Co., Murray Hill, N. J.

The equipment applies a high-intensity electron beam to weld beryllium, molybdenum, tantalum, zirconium, hafnium, etc.—metals which either can not be welded satisfactorily or are difficult to weld by conventional techniques. The electron beam bombards the materials to be welded in a high-vacuum chamber.

Seek the Reason Why

RESEARCH project designed to study reasons why magnesium and its alloys are not tough enough to allow full use is being supported at Case Institute of Technology, Cleveland, through a contract from Frankford Arsenal, Philadelphia. Research will be directed primarily toward a better understanding of the plastic flow kinetics or deformation characteristics of the metal and its alloys. It is indicated that once the strain rates and effects of pre-strain and temperature are understood, the results of the research will define the steps which must be taken to improve the metal's ductility and toughness.

Magnetic Properties

INVESTIGATION of "Magnetic Properties of Spheroidal Graphite Cast Iron" by Yuki Shirakawa and Takeshi Miyazaki, is reported in *Science Reports*, Research Institutes, Tohoku University, Sendai, Japan. It showed that with the same degree of graphitization, the coercive force and the hysteresis loss of spheroidal cast iron were lower than those of flake graphite cast iron, while with the maximum induction field at 100 oersteds, the residual induction and maximum permeability were higher.

With increase in degree of graphitization, the maximum permeabilities of both types of iron increased linearly, but with the maximum induction field at 100 oersteds, the residual inductions, coercive forces, and hysteresis losses decreased. Both spheroidal and flake graphite irons were of the same composition.

Glass Protects Couple

SMALL U-shaped pieces of Vycor glass tubing are being used to protect fine-gage platinum-platinum rhodium thermocouple wires in immersion type indicators for determining temperatures of molten steel, according to Corning Glass Works, Corning, N. Y.

Tubing and its contained wires are covered with a sheet steel jacket for protection against slag during the immersion. The covering melts away in contact with the molten steel, exposing the thermocouple to provide a temperature reading in 4 seconds. A new cartridge is used for each reading. The glass tubing is reported to withstand temperatures up to 3100° F and to possess excellent thermal shock resistance.

Alloying Agent

NEODYMIUM, one of the rare earths which may increase the elevated temperature resistance of magnesium for aircraft and missile applications, and may have application in steel and aluminum alloys, now is being produced in industrial quantities by Research Chemicals division, Nuclear Corp., Burbank, Calif. Although rare earth oxide mixtures are employed in magnesium alloys for elevated temperature applications, it is believed that neodymium is the most effective element.

Putting on the Squeeze

INVESTIGATION by Ernest B. Blake and Stuart V. Arnold, Watertown Arsenal, indicates that nodular iron may be hot extruded into bar stock, tubes, and structural shapes. Heat-treated sections possess good strength and moderate ductility. Details of the investigation are available in PB 131690, "Hot Extruded Ductile Cast Iron," which may be obtained from the Office of Technical Services, U. S. Department of Commerce, Washington 25, for 75 cents.

Condensed Data

A CARD listing 19 special alloys used in high-temperature applications in jet engines, gas turbines and turbo superchargers, and missiles is available from Allegheny Ludlum Steel Corp., Pittsburgh. Card is 3¾ x 5½ in. and gives composition of each alloy, its base material, density, rupture strength data at various temperatures, and its short time properties at room temperature and at 1200° F.

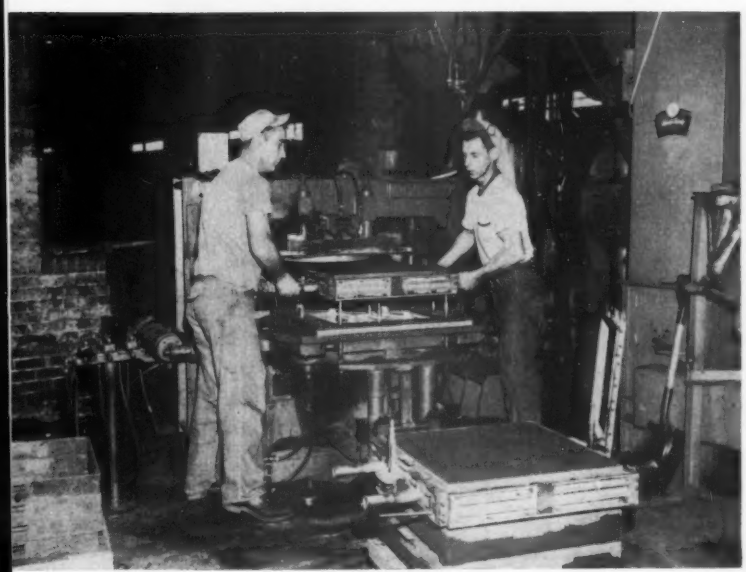
Circle 636 on Page 53→

ANOTHER

NEW INTERNATIONAL

SK20

Jolt-Squeeze-Drop Strip or Pin Push Up *or* Drop Strip Roll On - Roll Off



Here is a new machine, designed for larger requirements, incorporating sound engineering features, that can be made with

any size jolt

any size squeeze

any size draw

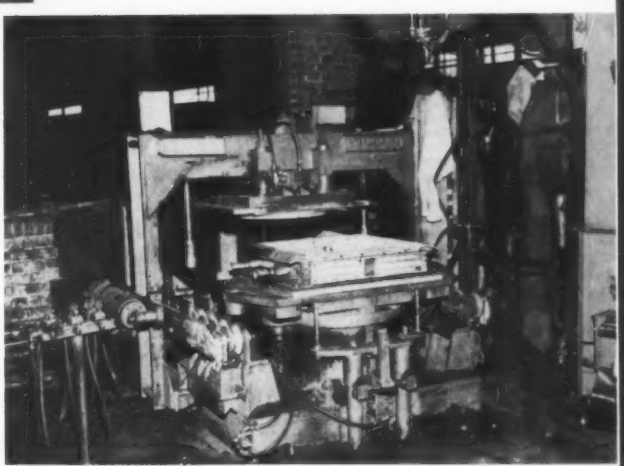
for any size job.

The SK20 illustrated has 20" squeeze cylinders, an 8" jolt cylinder, and is designed as a multiple molding machine—with a 4" draw. Picture shows hand control valves. It can also be furnished with partial or completely automatic control cycle.

Photos Courtesy of
PHILCO CORPORATION - Dexter Foundry Division - Fairfield, Iowa

Operational Features of the SK20

- ★ Head moves out – away from table of machine for easy loading of sand and flask.
- ★ Head moves in – Large V guides insure proper alignment of head over table for accurate and square, uniform squeeze – and true draw.
- ★ Two large cylinders control the movement of the head with oversized deceleration valves for cushioning.
- ★ Can be loaded from front – side – or rear.



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Write, telling us your particular needs.

We will forward complete information and suggestions.

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MOLDING MACHINE COMPANY

LAGRANGE PARK, ILLINOIS

Material Handling Institute

Plans Exposition and Technical Program

Cleveland Public Auditorium will be the site of the Material Handling Institute's Exposition

● SEVEN acres of exhibits of material handling equipment and three days of technical sessions are expected to attract more than 30,000 members of industry to Cleveland June 9-12 for the Material Handling Institute's Exposition of 1959.

Approximately 240 exhibitors will display the industry's latest equipment and services at the exhibit, the institute's first since 1956.

Technical sessions wil be held on Tuesday, Wednesday, and Thursday and will cover the broad areas of management, engineering, and application techniques. Each area will be handled, respectively, by the Society for Advancement of Management, the American Society of Mechanical Engineers, and the American Material Handling Society Inc.

For members of these groups, registration cost will be $12 for one day and $30 for all three days. Cost to nonmembers will be $15 for one day and $40 for all three. Registration for the exhibit itself will be screened to assure attendance only of those with direct interests in industrial material handling.

Hotel reservations are being handled by the Cleveland Housing Bureau, and requests for reservations should be sent to Mrs. Louise D. Perkins, director, Cleveland Housing Bureau, 511 Terminal Tower, Cleveland 13, Ohio.

EXHIBITORS

Acme Steel Co., Chicago
Albion Industries Inc., Albion, Mich.
Alden Systems Co.
Algene Marking Equip. Co., Garfield, N. J.
Allen Iron & Steel Co., Norristown, Pa.
Allis-Chalmers Mfg. Co., Milwaukee
American Chain & Cable Co., Bridgeport, Conn.
American Dockbridge, Inc., Milwaukee
American Metal Products Co., Detroit
American MonoRail Co., Cleveland
American Pulley Co., Philadelphia
Anchor Coupling Co., Libertyville, Ill.
Anchor Steel & Conveyor Co., Dearborn Mich.
Apex Welding & Fabricating Corp., Bedford, Ohio
Austin-Western Works, Aurora, Ill.
Automatic Transportation Co., Chicago
Automation, Cleveland

Baker Industrial Trucks, Cleveland
Ballinger-Meserole Co., Philadelphia
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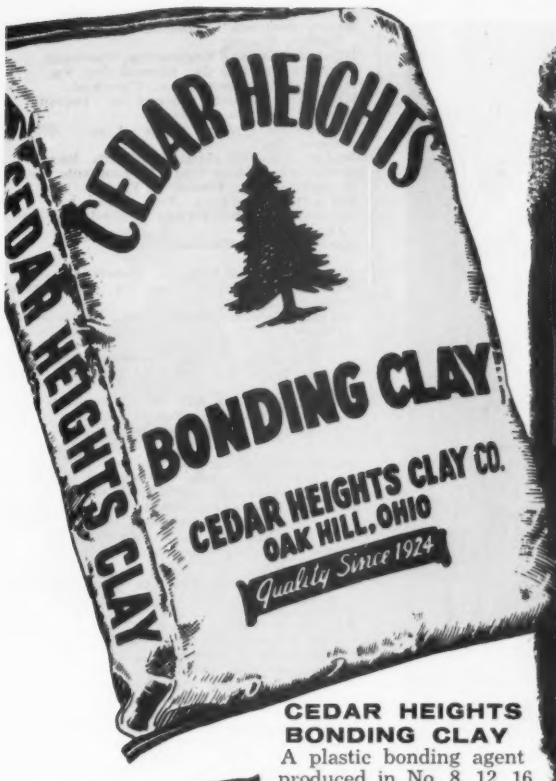

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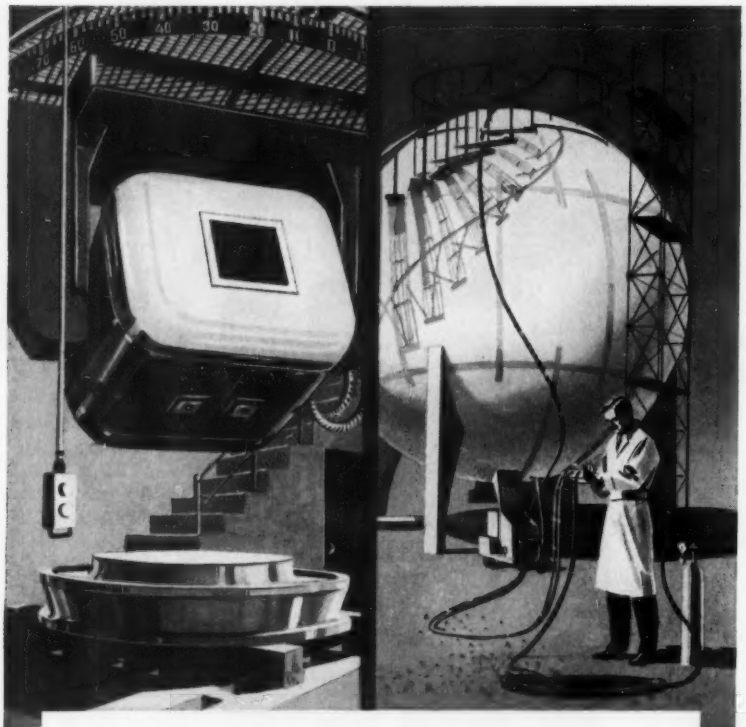

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Otto H. Rosentreter, Southern California Chapter chairman; Paul Bergmann, technical section chairman, and Ed Gaskell, general conference chairman

Heavy Attendance Marks

CALIFORNIA REGIONAL CONFERENCE

By WILLIAM G. GUDE
Managing Editor

● CALIFORNIA foundrymen turned out in record number at Pasadena on March 13-14 for a highly successful Regional Foundry Conference.

Southern California Chapter, American Foundrymen's Society, was host of the meeting, which also was sponsored by the Northern California Chapter. Registration at the Huntington-Sheraton Hotel, the conference site, topped 350.

Chapter President Otto H. Rosentreter, Otto H. Rosentreter Co., Bell Gardens, Calif., welcomed the registrants at the opening technical session, and was seconded by Ed G. Gaskell, Ace Foundry Ltd., Huntington Park, Calif., general chairman of the conference committee.

Opening technical session was a molding symposium devoted to three of the newer molding methods.

Shell Molding—Shell mold castings are being produced today in sizes not dreamed of five years ago, according to Walter Dunn, Pacific Alloy Engineering Corp., El Cajon, Calif. He sees a bright future for the process, with additional applications likely to develop in the automotive and aircraft fields. Production of castings up to 6 to 8 ft long eventually will occur, he said.

A number of problems still face the shell mold foundry. Warpage of large shells has not yet been solved. Little improvement has resulted in recent years in surface finish. It had been hoped to attain a finish of 100 rms or less, which would broaden application of castings, but current finish is about 200 rms.

Other problems are carbon pickup in casting certain types of steel, and the high cost of patterns, particularly for short runs.

Probably the greatest problem today is gas evolution. This condition results in gas holes and prevents adequate mold filling. Mr. Dunn feels that the answer to the problems of gas evolution and carbon pickup eventually will be solved by use of an inorganic bond.

Ceramic Molding—Foundry practice in production of close tolerance castings in ceramic molds was described by Leonard W. Dean, foundry consultant, Brea Alloys & Mfg. Co., Brea, Calif. These castings are being made of principal common metals, although most of them are of steel alloy. Average weight is approximately 30 lb.

The ceramic slurry consists of ethyl silicate, alcohol, and water mixed with a combination of both

H. J. Pfeifer, L. D. Hutchinson, D. B. Reeder, R. A. Aeberly, all of Union Carbide Metals Co.

Bruce Farrow, reception committee chairman, Philip A. Grimard, James Barr, and B. J. Schubert

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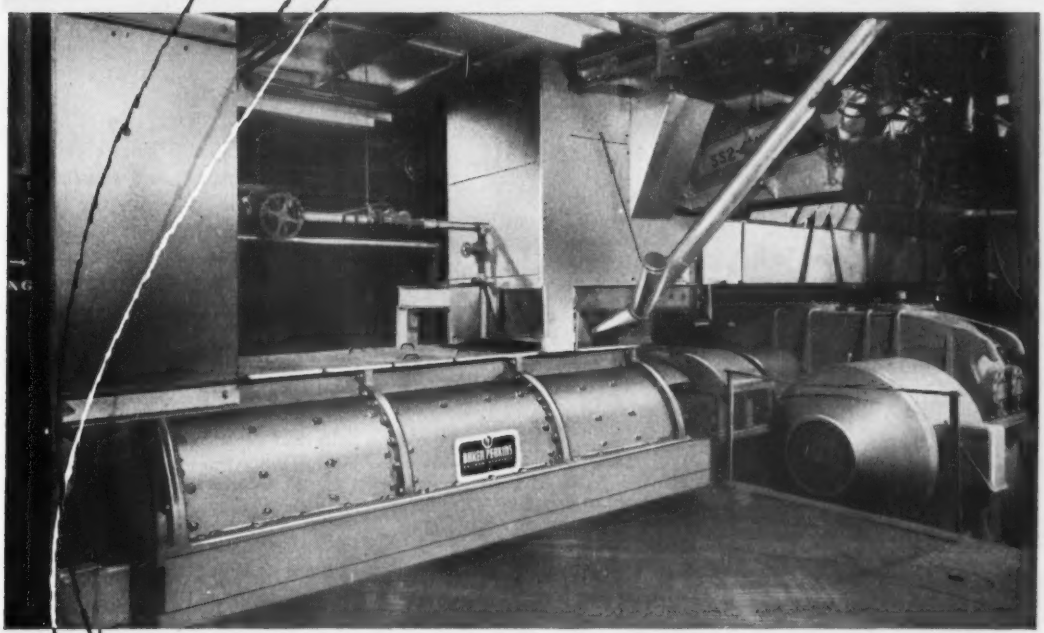

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Baker Perkins builds Continuous Mullers in capacities from 30 to 300 tons per hour. Because of their rigid, rugged construction, B-P Continuous Mullers give many years of service. Installations in many of America's largest foundries have proven the efficiency of Baker Perkins Continuous Mullers under the most exacting conditions.

For further information about B-P Continuous Foundry Sand Mullers and B-P Unidor mixers for core and special process sand mixing, send for catalog No. F-156.

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T. S. McCrory, George O. Pfaff, Davis Taylor, and W. S. Schamel, all of Wheelabrator Corp.

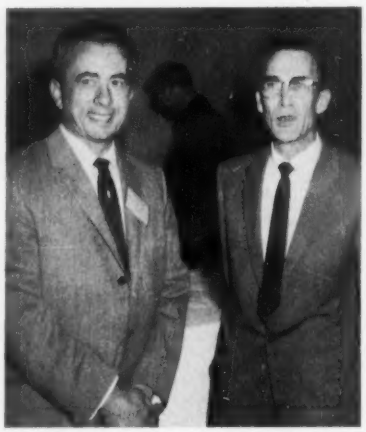
B. G. Emmett, steel session chairman; Hubert Chappie, speaker, and Paul Crow, co-chairman

coarse and fine-grained silica sand. The pattern is coated with a release agent before the slurry is poured into a flask while being vibrated. The setting time of the slurry can be controlled from 30 seconds upward. Elasticity of the mold material assists in pattern drawing. Mold halves are clamped together during the subsequent firing operation which eliminates additional moisture from the molds.

Molds may be poured either hot or cold. Slow pouring of the metal is necessary because of the smooth surface of the gating system. Consequently, small sprues and gates are employed. Hardness of the ceramic material makes shakeout a problem in some cases. High metal yields are obtained from the process, the average being about 70 per cent.

Sodium Silicate — Mold production offers the big future use of carbon dioxide gassing of sodium-silicate-bonded sand, it was predicted by Frank Brewster, Brumley-Donaldson Co., Huntington Park, Calif. He sees a growing market for high-speed production of small parts, particularly in stack molds. Another growing market will be for production of close-tolerance castings.

Use of sodium-silicate binders requires close scheduling of both mixing and molding operations. Mixed sand should be kept covered until used, since a variation of ½ of 1 per cent in moisture can have a serious effect. Because these sands have poor green strength, gassing while the core is in the box or the mold is in the flask is desirable for accuracy. If a core wash is used, it should be an alcohol base type, not water base.



Anthony Polizzotto, speaker, and Henry Howell, session chairman

Mr. Brewster recommended that more attention be given to the hardness of cores, rather than to their tensile strength. A scratch hardness of 80 to 85 with a tensile of 100 psi generally is satisfactory.

In the interest of economy, use of automatic gassing equipment is desirable. Addition of 4 oz of oil to 100 pounds of sand has been found helpful when cores are to be blown. Collapsing agents generally have not been found satisfactory; it is preferable to reduce the binder addition. On the other hand, addition of 1 to 2 per cent iron oxide helps thermal stability. Various types of sand mixers have proved satisfactory, and mixing should continue until lumps disappear. The sand then should be used promptly.

Nonferrous Foundry Practice— Selection of molding methods used in the brass foundry will depend to a large extent on the casting requirements. Norman Barnett, M. Greenberg's Sons, San Francisco, pointed out that shell cores are ideally adapted to certain types of work. In one instance a 2-lb shell core replaced a 9½-lb solid blown core. CO_2 cores are desirable for use in large work and rush production.

Close control over the numerous

Charles R. Gregg, session chairman; Frank Brendler, speaker, and Kenneth Clark, session co-chairman

L. H. Durdin, AFS president; W. W. Maloney, general manager; Jake Dee and John Russo, directors

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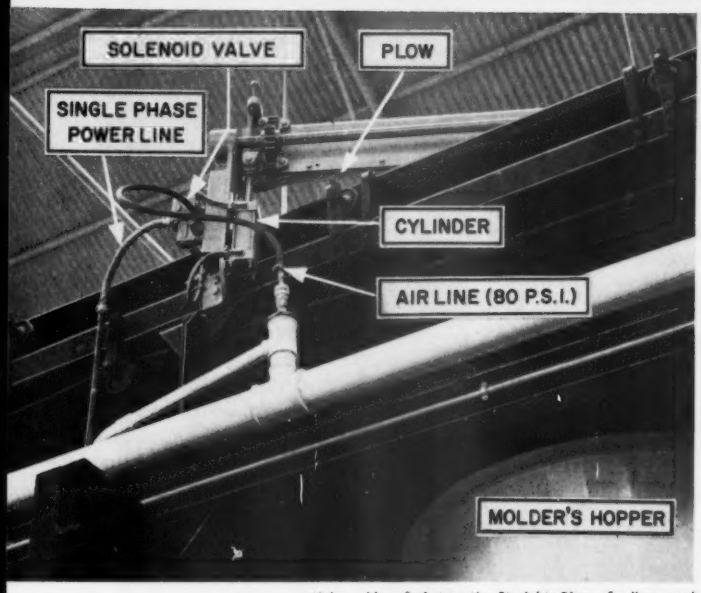
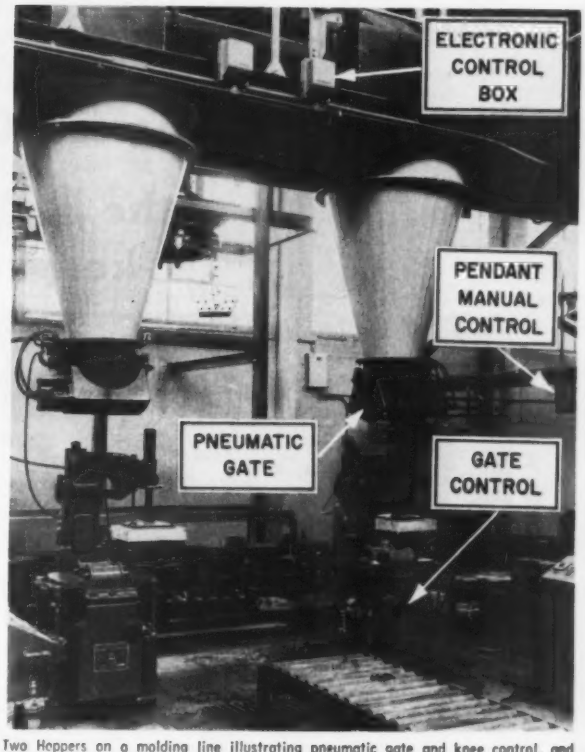
AUTOMATIC PLOWS



Valve side of Automatic Straight Plow, feeding sand from distribution belt into one of eight molder's hoppers on continuous casting plant.

INSURE SAND SUPPLY WITH LABOR ECONOMY



Two Hoppers on a molding line illustrating pneumatic gate and knee control, and showing position of pendant control for automatic plow. This incorporates indicator lights and push button for independent manual control.

Proved Electronic Hopper Level Indicator and Automatic Plow System cuts labor, reduces effort, improves production and is further step toward foundry automation. If you operate an overhead distribution belt conveyor in your sand system. This MUST interest you!

- ★ Plows may be straight or vee, for any standard belt between 16" and 36" wide, and can be fitted in new or existing installations-replace your hand plows with automatics!
- ★ Economy—no man on platform; therefore saving wages and overheads, ensuring rapid pay-off. Sensitivity of operation reduces throughput of sand for given mold output.
- ★ All molders, all the time, are assured of sand supply—from two, to any number of machines in the line.
- ★ No sand spillage over top of hoppers and no loss of production thru sand shortage.
- ★ Fully automatic, interlocked, fool proof electrical system.
- ★ All plows fitted high precision single solenoid pneumatic valves, interchangeable with front line U.S. made valves, proved thru millions of operations.
- ★ Complete flexibility—any one, some or all plows can also be push button operated from pendant control adjacent to molder's working position.
- ★ Pendant control incorporates indicator light signals, so each molder knows what is happening above.
- ★ Used with our pneumatic gates, provides most modern method of sand supply to molding machine line.
- ★ Can also be used in larger molder's hoppers with feeder belt discharge.

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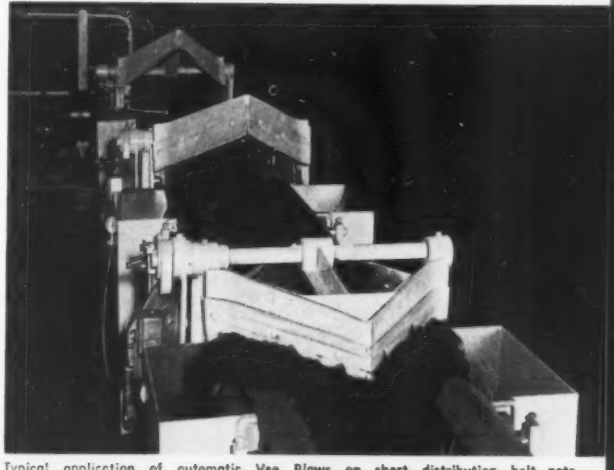

Typical application of automatic Vee Plows on short distribution belt—note compact valve and operating mechanism on left.

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variables in brass foundry operations is imperative. At the same time solutions of difficulties encountered in one shop may not apply in another.

Gating and risering practice with a number of brass castings was described. It was pointed out that uneven ramming or hard spots on the mold surface can cause misrun in production of flat plates.

Ductile Iron—The future market for ductile iron castings will expand considerably if it is developed properly, it was stated by Frank Brendler, Stanley Foundries Inc., Huntington Park, Calif.

He described various problems encountered by producers during the last 10 years when operating practices were being developed. These problems were concerned with inoculation technique, gating and risering, heat treating, sand control, and pattern design.

Many of the difficulties in obtaining reproducibility of castings have now been overcome. At the same time, production of ductile iron requires close control, trained personnel, effective cost standards, and the ability to design a part properly for a correct application. Capable sales engineers are essential.

It is predicted by persons close to the ductile iron industry that production of castings by 1961 will approximate 1½ million tons and that a 5-million-ton year eventually will result.

A Challenge to Pattern Design—Requirements of the missile industry were discussed by Paul C. Ricks, engineering dept., AiResearch Mfg. Co., Los Angeles. Among the requirements of this industry are small high-strength castings which can be made in various metals in thin sections. Miniature requirements of this industry were illustrated among several products by a gas-turbine powerplant of 50 hp, largest dimension of which was less than 6 in.

Induction Melting—Three papers were presented on the subject of induction melting of various types of metals. Melting of both carbon and alloy steels in high-frequency furnaces was described in a paper by J. William Mitchell, Utility Steel Foundry, Vernon, Calif. The paper was presented by John E. Wilson, Climax Molybdenum Co., Los Angeles. This foundry has three furnaces, varying from 700 to 1500 lb capacity.

The furnaces have the advantages of flexibility which makes possible the production of special heats; good control over carbon content, and good adherence to desired temperature. Disadvantages include the high initial cost, absorption of gases, and relatively high labor costs. In addition, power costs and cost of metal charges are higher than with the arc furnace. Loss of alloy additions during melting is low.

It was pointed out that wash heats are necessary in changing compositions from high alloy to low alloy content. No problem is encountered in going in the other direction in alloy content.

Melting of gray iron in the low-frequency induction furnace has these advantages, according to Mel Hartman, Dayton Foundry, Hollydale, Calif.:

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2. Absence of an air pollution problem.

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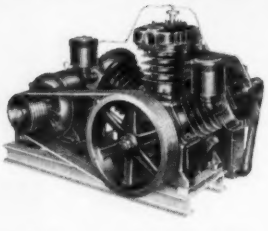

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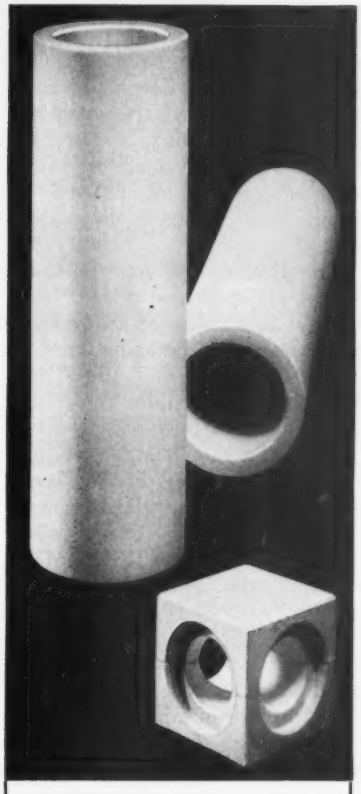

Louthan gate tiles cut foundry costs

You minimize casting problems, get cleaner castings when you use Louthan refractory gate tiles (elbows and tees to match). They prevent erosion of the gates in steel castings, safely withstand high temperatures, will not react with the molten metal. All popular diameters and lengths can be furnished.

Write for Free Gating and Risering Refractory Folder. Complete file of specifications on all Louthan products.

LOUTHAN
MANUFACTURING COMPANY
A DIVISION OF FERRO CORPORATION
EAST LIVERPOOL, OHIO

Circle 643 on Page 53

3. Absence of element losses, except for a slight loss in silicon.
4. Low operating costs.

Disadvantages include limited production capacity, 1 ton per hour being the maximum. While the initial cost is relatively high, depreciation is low. Molten metal is required to start and restart the furnace, and power must be on at all times. Some difficulties are encountered in changing metal specifications. The 1500-lb capacity furnace used at Dayton Foundry requires 500 lb at all times in the heel of the furnace. Maximum operating temperature is about 2800° F.

On the basis of two-shift operations, cost of iron at the spout for metal melted in a low-frequency furnace is approximately the same as that melted in an arc furnace. This cost is a fraction of a cent less than for cupola iron.

In discussing use of induction melting equipment for the nonferrous foundry, A. W. Nash, A. W. Nash Co., Los Angeles, pointed out that the choice of a high or low frequency type unit depends on the number of alloy changes in the foundry. The high-frequency type is preferred where alloys are changed often.

He quoted figures to substantiate his statement that the only major basis for using induction melting equipment instead of other types is that the relatively larger amount of metal recovered from the charge is sufficient to offset the higher costs of the equipment initially.

Epoxy Resins for Patternmaking —Use of epoxy resins in production of dies and patterns was described by D. J. Bryan, Furane Plastics Inc., Los Angeles. Steps in the manufacture and maintenance of these resin products were demonstrated.

Aluminum Castings — New and higher properties in aluminum alloys will permit the substitution of castings for expensive fabricated assemblies in aircraft and other products, it was predicted by Anthony Polizzotto, A & M Castings Inc., South Gate, Calif. Future requirements for foundries include precision patterns, tighter control, and application of research developments.

In quoting on current work, the foundry should check blueprints for tolerances, required fixtures, and

This machine produces pipe from 2 to 6 inches inclusive in diameter

CAST SOIL PIPE CENTRIFUGALLY

THIS MODERN METHOD PROVIDES

Product Uniformity
Perfectly Concentric Pipe
No Sand Blasting or Other Cleaning Necessary
Use of Unskilled Labor
Small Man-Hour Cost
High Production
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We supply complete equipment and technical information for production of centrifugally cast soil pipe.

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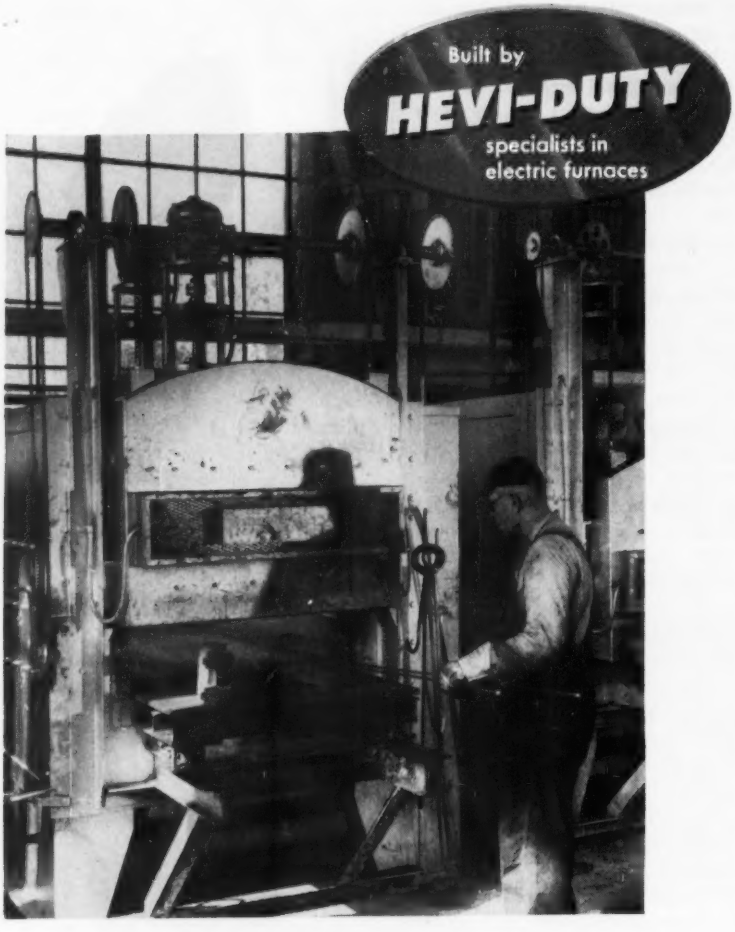
Circle 644 on Page 53



Byron Jackson Division, Borg-Warner Corporation, hardens and tempers high-strength components for oil well tools in this Hevi-Duty box furnace

Steel parts processed by Byron Jackson, Los Angeles, face unusually tough tests. They are used in oil well tools where every additional foot of depth adds still further to the weight, strain and torsional stress. In one instance, this equipment drilled to a depth of 23,000 feet — the greatest depth ever attained to date.

Byron Jackson found that components both hardened and drawn in the Hevi-Duty Multi-Range furnace provided maximum high strength characteristics. The wide temperature range combined with precise, uniform control make this furnace ideal for both operations.

Write for Bulletin 341 for complete information on Hevi-Duty Multi-Range Box Furnaces.

- Heat Processing Furnaces
- Dry Type Transformers
- Constant Current Regulators

HEVI-DUTY ELECTRIC CO.
Milwaukee 1, Wisconsin

whether it has the proper rigging and ability to produce the particular castings. Efficient pattern equipment is necessary. Keeping of adequate shop records is essential, including the recording of past history on how individual jobs were produced. Above all, develop in personnel the desire to do quality work.

Sand Reclamation and Air Conveyors — Experience gained from some 60 installations of sand recovery by the dry scrubbing method indicates that successful use of the reclaimed sand requires only the usual degree of good sand control. Cost of the scrubbing operation usually is not more than 60 cents to $1 a ton, including labor, power, and maintenance. These points were brought out by R. L. McIlvaine, vice president, National Engineering Co., Chicago.

The dry scrubbing reclamation method is employed with sands which are very dry and flowable. Since this type of sand is susceptible to segregation, segregation must be prevented in the storage bins prior to scrubbing and in subsequent storing and conveying operations.

High-pressure and low-pressure types of air conveying systems were described. The former is used for moving prepared sand. It consists of a pressure vessel into which sand is admitted through a gate, which then is closed, and compressed air is admitted to the vessel. This air forces the sand out through the pipe at the bottom and then to the receiver at the molding station. It is a good means of transporting sand from a preparing plant to one or two molding stations. If many receiving stations are required, however, a belt conveyor may be more satisfactory.

The low-pressure air conveyor usually is desirable when dry, granular materials are handled. Usually it is some form of pipe system through which air at 4 to 8 lb pressure is forced in sufficient volume to obtain 5000 to 10,000 fpm velocity.

A simpler system is merely a means of entraining sand in the air stream from a nozzle and permitting it to escape through a pipe. The air stream creates necessary pressure in the piping system to carry the material to the discharge point.

Pressure Molding—Advantages of

Circle 645 on Page 53

Improve the physical properties of your aluminum castings with

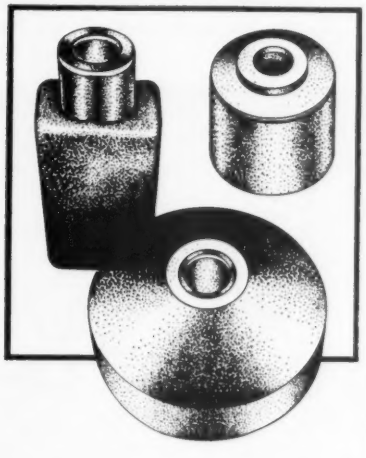
Foseco® NUCLEANT

grain-refining compounds

This bulletin tells you how. Send for your free copy today.

Foseco®
FOUNDRY SERVICES, INC.
2000 Bruck Street, Columbus 7, Ohio

Circle 646 on Page 53



CUT YOUR COSTS and SAVE YOUR PATTERNS with ARROW BUTTS and PEINS

Over one half million have been used with complete satisfaction. Send for catalog on complete line of butts and peins. We feature 13 types. Sand rammer butts are our business, not our sideline.

Arrow BUTT COMPANY
4800 W. 139th St., Cleveland 11, Ohio

Circle 647 on Page 53

pressure molding, it was pointed out by William L. Adams, International Minerals & Chemicals Corp., Skokie, Illinois are the following: Elimination of human error; reduction of casting and sprue weight; closer dimensional control; elimination of tucking and peening time; reduced maintenance of patterns, flasks, and machines; high production.

Pressure molding essentially is a controlled green sand molding process in which mold shape, sand flowability, and molding pressure are combined to produce molds hard and dense enough to reproduce pattern dimensions and finish with high accuracy and uniformity.

The prerequisites of pressure molding are:

1. Good pattern practice and strong flasks.
2. A fine-grained sand of at least four screens which is high in green strength, low in moisture, tough and flowable.
3. Pressure that will develop the desired mold density. This density will require high pressures with a flat platen or peen block squeeze, but normal pressures will suffice in the case of the diaphragm type machine where the squeeze always is toward the pattern character.

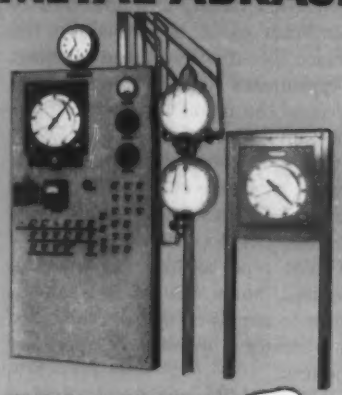
The Future of Castings—Manufacture of high-quality ferrous castings offers an exceptionally wide field for conversions, said John M. Anspach, Meehanite Metal Corp., New Rochelle, N. Y. With advancing quality standards, however, it is necessary for the foundry to begin thinking in terms of standards based on today's more rigid inspection techniques. New and growing industries, including aircraft, electronics, and atomic power, offer potentials for increasing use of castings.

The foundry seeking to enter new fields for business should first check the markets, determine if it has the required technical talent, and analyze its capabilities in terms of the necessary tools and practices.

Molding and Pouring Aluminum—Sensitivity of aluminum to moisture dictates keeping molding sand on the dry side, it was pointed out by George W. Stewart, East Bay Brass Foundry, Richmond, Calif. Wet sand and hard ramming can cause drossy metal and porous castings. A gating system for aluminum

Circle 648 on Page 53→

Now!
METAL ABRASIVE



CUSTOM MADE for YOU

The newest development in manufacture of metal abrasive is custom-made "Malleabrasive"—job-lot-made to meet individual cleaning conditions.

By means of new, highly specialized processing techniques and equipment used only by us, we can make the type of "Malleabrasive" shot or grit that will do your particular job best, at lowest cost to you.

Why put up with general purpose abrasives when you can have "Malleabrasive" tailor-made for you? We'll welcome the chance to tell you how you can benefit. Write us.

THE GLOBE STEEL ABRASIVE CO.
Mansfield, Ohio

Sold by Pangborn Corp., Hagerstown, Md., and by many leading distributors of foundry supplies from coast to coast.

MALLEABRASIVE

should be designed so that, as it is filled with metal, a single skin of aluminum oxide is formed on the surface of the gate and casting. Every means should be employed to cause the metal to flow with the least amount of turbulence. Down gate or sprue should be tapered and choked at the bottom. Place runner and ingates in the drag when possible. A top riser is the most efficient type because less metal is required, but a side riser usually is easier to supply with hot metal and thus creates a favorable temperature gradient.

When chills are used, feeders usually are required to provide metal needed to prevent shrinkage. Chills always should be blast cleaned before use. Wrought material for chill metal is preferred because it does not absorb moisture from the sand as readily as does cast iron.

Reducing Blast Cleaning Costs— Many economies inherent in the use of airless blast cleaning equipment are being overlooked by foundry management, according to George O. Pfaff, Wheelabrator Corp., Mishawaka, Ind.

Controls for checking inefficient operations include regular readings of the wheel motor ammeter, regular abrasive additions to the machine, periodic hot spot checks, and regular screen analyses of the abrasive operating mixture and separator discharge. Institution of operating controls has resulted in sizable savings for many foundries. Answers to the following questions will indicate whether savings can be made in blast cleaning costs:

1. Is the abrasive free from sand?
2. When screened through a No. 40 screen, is the abrasive discharge free of usable abrasive?
3. Are the machines equipped with properly functioning ammeters, and is a full load of abrasive being thrown?
4. Are hot spot checks made regularly?
5. Are cost-saving abrasives and liners that are now available being used in the machines?
6. Is a comprehensive cost system in force that can pinpoint cost variations?

Cupola Melting and Charging Equipment — Detailed illustrations of recently installed cupolas were presented and their important fea-

Are shell mold all pretty much

"No!" say men in two big foundries. They've poured millions of shell mold castings

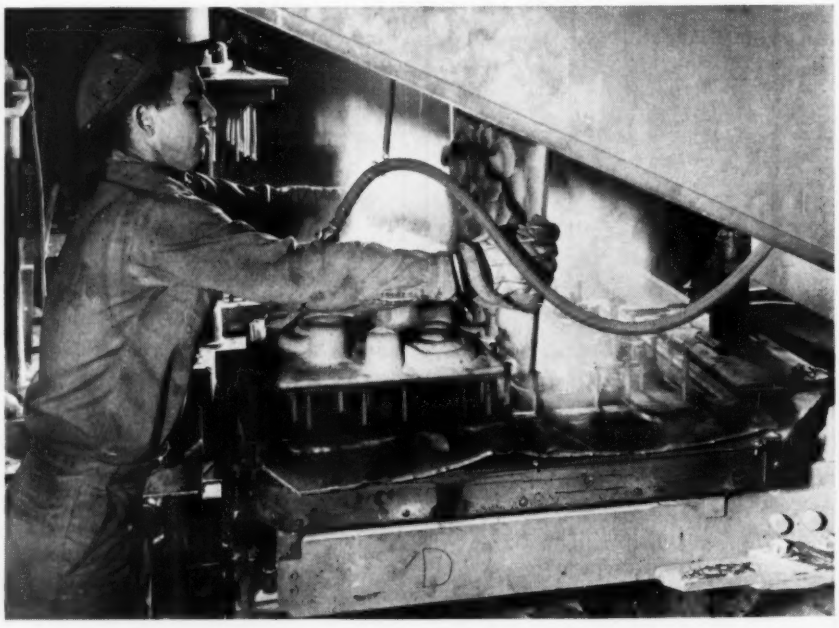
Here's how they feel about resins

Talk to the men at Dayton Malleable Iron Company—one of the country's biggest independent foundry firms—and you find strong conviction on foundry resins.

You also find one brand of resin mentioned more than any other.

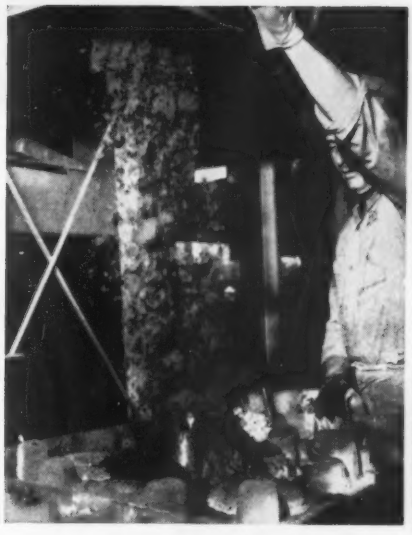
That one is Durez.

"If there were a better resin made, we'd be using it," says B. D. Claffey,



SHELL MOLDS at Dayton Malleable's G.H.R. Foundry Division eliminate shift between cope and drag, minimize machine stock requirements, and often reduce machining time. Shell cores can be held close to size and give clean, smooth surfaces. No core driers are needed, and warpage is less a problem than ever before. On one difficult core job, a switch from oil sand to shell reduced scrap more than 50%.

resins alike?



DAYTON'S IRONTON MALLEABLE DIVISION uses shell for close tolerances, low metal weight, smooth finish on pearlitic malleable transmission parts. Day-in, day-out uniformity of Durez resin helps keep production rates high.

general manager of Dayton's huge G.H.R. Foundry Division at Dayton, Ohio. G.H.R. uses Durez resin for molds and cores in making light and medium weight gray iron castings for autos, refrigerators, and other appliances.

"Same results every time"

"We find Durez resins are the easiest to control," continues Mr. Claffey. "We get the same results every time with them." This uniformity can make the difference between profit and loss on many jobs.

"We also like the service we get from Durez sales engineers," Mr. Claffey concludes. "They talk our language, and have helped us over some rough spots."

"Less peel"

Over at Ironton, Ohio, L. J. Gallagher, general manager of another big Dayton Malleable foundry, the Ironton Malleable Division, feels the same way about Durez resins and the service that goes with them.

The Ironton foundry pours high-strength pearlitic malleable for gears, sprockets, camshafts, chains, transmission parts, truck brake shoes, axle and differential parts.

Ironton production men say "We get less peel—less of every problem—with Durez resins in our molds and cores."

These men, too, like the drum-to-drum consistency of Durez that helps keep the ups and downs out of casting quality.

Resin problem? Here's help

If your shell molding and coring results aren't all you would like them to be, have a talk with your Durez sales engineer. He's foundry-trained—can draw on a 38-year background of resin research and application. He has helped many foundrymen whip shell-molding and coring problems and get consistent results. Call him in soon.

How-to-do-it information

Regardless of which resins you now use, you will find the new 32-page "Durez Guide to Shell Molding" helpful. Completely revised, it contains recommendations on patterns, materials, mixing, temperatures, lubricants, molds, cores. It's by men who have spent years learning the subject. Write for your copy today.

DUREZ PLASTICS DIVISION

HOOKER CHEMICAL CORPORATION

1005 WALCK ROAD, NORTH TONAWANDA, N.Y.

HOOKER CHEMICALS PLASTICS

tures described by Harold W. Schwengel, Modern Equipment Co., Port Washington, Wis. These installations incorporate some of the newer developments in melting equipment, including hot blast, water cooling, and sealed top, in addition to dust control equipment.

Sand and Related Facts—This discussion of the production of large steel castings, by Hubert Chappie, National Supply Co., Torrance, Calif., is presented in full in this issue starting on Page 96.

Lewis H. Durdin, national AFS president, addressed the first of two luncheon sessions. He stressed the need for increased foundry research to improve casting quality and broaden the market for cast products.

Gordon L. Martin, Atlas Foundry & Mfg. Co., Richmond, Calif., Northern California Chapter chairman, spoke at the second luncheon and emphasized the values to be obtained from participation in the new AFS T & RI program.

Guest speaker at the Friday evening banquet was Maj. Gen. Joseph D. Caldara, director of flight safety research for the U. S. Air Force. He emphasized the growing need for higher quality in aircraft components because of the constantly increasing speed of modern planes.

Kaiser Steel Corp. and Columbia-Geneva Steel Corp. were hosts at social hours on Friday and Saturday evenings, respectively.

California Conference photos furnished through courtesy of K. F. Sheckler, Calmo Engineering Co., Los Angeles.

Book Review

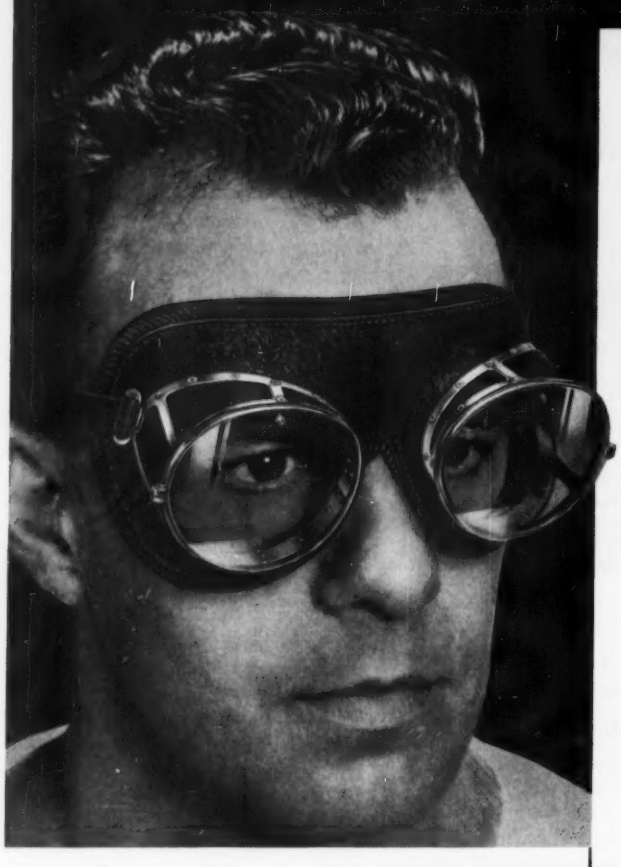
Defining the Manager's Job, **by C. L. Bennet, paper, 448 pages, 6 x 9½ in., a research study published by the American Management Association, 1515 Broadway, New York 36. Price $9.**

This manual of position descriptions is based on a survey of 140 companies. Approximately 150 position descriptions for all managerial levels are reproduced to supply basic data required when reviewing organization structure.

The text explains how to establish an effective description program, how to gain its acceptance, and how to prepare position descriptions. Position descriptions, with organization charts for the entire top management of two firms also are included.

Circle 649 on Page 53

Increased Safety for Foundry Operations*



*Because of

Greater Protection!

Bigger face mask protects more of face

Better Vision!

57.8 mm. wide vision lenses instead of 50 mm. round lenses (the 50 mm. types were fine in their day but American Optical's policy is constant research for continued improvement).

Increased Ventilation!

Double the air flow via a 40 mesh screen

Perfect Fit!

Accommodates most types of spectacle glasses. Novel attachment of adjustable headband through metal frame (instead of through mask) insures close fit.

Mask is soft plastic. Edges are sponge rubber, corduroy-bound. Standard screw endpieces. Lenses are Super Armorplate clear or Calobar medium, dark or extra dark.

Note: If dust is a problem ask about our companion model with 150 mesh inner screen and 16 mesh outer screen — No. 316.

This Spat won't Curl Up — and that's Good!

The S7X211 spat *stays* put — protects from splash burns where it meets shoe. Made of a special compound, it lasts longer — up to 400% longer. Flare is 7½" long and may be trimmed to fit smaller foot. Chrome leather ankle length with top of elastic webbing. 2 snap fasteners on elastic with 2 leather adjustable ankle straps. Understrap same material as flare and replaceable.

This Hot Weather Favorite is Light on the Face!

Light on face and pocketbook this BUREAU OF MINES APPROVED R9100 RESPIRATOR is fine for hot jobs and summer wear. R9100 protects against pneumoconiosis-producing and nuisance dusts. Weighs only 2 ounces. *Lowest priced, approved respirator on the market.* Easy to breathe in, easy to clean, reusable many times. May be worn with goggles.

Another Hot Weather Tip!

Keep your workers cooler, safer, more efficient with AO Sweatbands. Stops brow-mopping. Sweat can't sting eyes, blur vision or carry foreign matter into eyes. 1¾" wide cellulose. Can be washed and used over and over. 109B absorbs 16-20 times its weight. Reinforced.

Always insist on ® *Trademarked Safety Products*

YOUR NEAREST AO SAFETY PRODUCTS REPRESENTATIVE CAN SUPPLY YOU.

American Optical
COMPANY
SAFETY PRODUCTS DIVISION
SOUTHBRIDGE, MASSACHUSETTS

Safety Service Centers in Principal Cities

Literature for Foundrymen

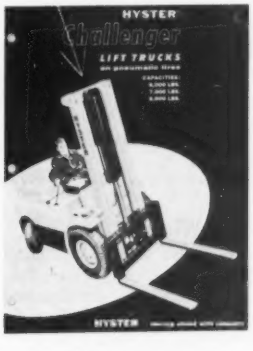
In-Plant Training

Brochure details procedures for setting up and servicing in-plant study groups using courses of the American Society for Metals, Metals Engineering Institute. Subjects include elements of metallurgy, nuclear metallurgy, heat treatment, stainless steels, electroplating, and other metallurgical subjects.—**Metals Engineering Institute,** Dept. RV-1, 7301 Euclid Ave., Cleveland 3, Ohio.

For More Details Circle No. 401—Page 53

Fork Lift Trucks

Brochure covers performance, construction, and maintenance features of pneumatic tire lift trucks in capacities of 6000, 7000, and 8000 lb at 24-in. load centers. Included are a list of options,



attachments, and accessories for the trucks and a cutaway view showing all machine components.—**Hyster Co.,** 1003 Myers St., Danville, Ill.

For More Details Circle No. 402—Page 53

Dust Collectors

A packet of brochures covers the several types of dust collectors made by the company for high and low temperature applications. The types include bag, filter, centrifugal, electrostatic, and wet scrubber collectors.—**Western Precipitation Corp.,** Box 2744, Terminal Annex, Los Angeles 54, Calif.

For More Details Circle No. 403—Page 53

Molybdenum Alloys

Abrasive wear is discussed in booklet. How to produce abrasion-resistant parts with irons and steels incorporating molybdenum alloys is detailed in an extensive section.—**Climax Molybdenum Co.,** division of **American Metal Climax Inc.,** 500 Fifth Ave., New York 36, N. Y.

For More Details Circle No. 404—Page 53

Rollover Draw Machines

Bulletin 5115 discusses in detail hydraulic rollover draw machines for molds and cores. Capacities range from 1000 to 15,000 lb.—**Beardsley & Piper,** division of **Pettibone Mulliken Corp.,** 2424 N. Cicero Ave., Chicago 39, Ill.

For More Details Circle No. 405—Page 53

Track Wheels

Catalog 34 contains a stock list with specifications and data on a line of cast track wheels and rollers. Sizes range from 2 in. in diam by 7/8-in. face to 36 in. in diam by 12½-in. face.—**C. O. Bartlett & Snow Co.,** 6200 Harvard Ave., Cleveland 5, Ohio.

For More Details Circle No. 406—Page 53

Permanent Magnetic Pulleys

Bulletin PY-260 gives descriptive data, design features and full specifications on nonelectric magnetic pulleys. Bulletin MD-200 deals with nonelectric magnetic drums.—**Homer Mfg. Div., Ohio Electric Mfg. Co.,** Lima, Ohio.

For More Details Circle No. 407—Page 53

Aluminum Alloys

Composition, properties, and physical and mechanical characteristics of primary aluminum casting alloys are detailed in brochure.—**Federated Metals Div., American Smelting & Refining Co.,** 120 Broadway, New York 5, N. Y.

For More Details Circle No. 408—Page 53

Induced Draft Fans

Bulletin L-3 describes advantages and features of induced draft fans and includes dimensioned drawings, charts of ratings and specifications.—**Lehigh Fan & Blower Div., Fuller Co.,** Catasauqua, Pa.

For More Details Circle No. 409—Page 53

Arc Welding

Brochure EW-204 describes arc welders in a wide selection of types and sizes. Brochure EW-205 covers a complete line of welding electrodes.—**Hobart Brothers Co.,** Troy, Ohio.

For More Details Circle No. 410—Page 53

Belt Cleaner

Bulletin 258 describes a spring-type cleaner for conveyor belts.—**Standard Products Div., Stephens-Adamson Mfg. Co.,** Aurora, Ill.

For More Details Circle No. 411—Page 53

Core Sand Mixer

Leaflet describes 100-lb capacity paddle-type mixer for sand used in cores made by the CO_2 process.—**Gilson Mfg. Co.,** Oostburg, Wis.

For More Details Circle No. 412—Page 53

Vacuum Casting

Data sheet describes a vacuum arc furnace designed to produce shaped castings and ingots of titanium, zirconium, and other hard-to-melt metals. The furnace is convertible between consumable and nonconsumable melting and between use of skull or cold mold.—**NRC Equipment Corp.,** 160 Charlemont St., Newton 61, Mass.

For More Details Circle No. 413—Page 53

Variable-Speed Drives

Variable-speed drives designed to provide precise, infinitely adjustable output speeds from a constant-speed motor operating on standard alternating current circuits are described in Bulletin G-5812.—**Reeves Pulley Co.,** division of **Reliance Electric & Engineering Co.,** Columbus, Ind.

For More Details Circle No. 414—Page 53

Metal Abrasives

Catalog 159 covers SAE specifications on all types of abrasive shot, grit, and cut wire, and lists characteristics, considerations, and uses of the abrasives.—**Cleveland Metal Abrasive Co.,** 888 E. 67th St., Cleveland 3, Ohio.

For More Details Circle No. 415—Page 53

Belt Conveyors

Catalog ID-591 contains engineering and selection data on the company's belt conveyor products, including roller bearing and ball bearing idlers.—**Industrial Div., Material Handling Dept., Continental Gin Co.,** Birmingham 2, Ala.

For More Details Circle No. 416—Page 53

Switches

Dimensions, electrical ratings, characteristics, and application information on snap-action and mercury switches are given

in Catalog 101-d.—**Micro Switch,** a division of **Minneapolis-Honeywell Regulator Co.,** Freeport, Ill.

For More Details Circle No. 417—Page 53

Cylinders and Fittings

Hydraulic, pneumatic, and vacuum catalog contains flow charts, JIC piping, and other helpful information for engineering and maintenance department personnel. Data included on O-ring seal tube fittings,

SAVE

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Acme

MELTING POTS

INGOT MOLDS

Designed by
FOUNDRYMEN...
for FOUNDRYMEN

You'll find it pays to standardize on Acme melting pots and ingot molds. They reduce down time and replacement costs because they're cast from a special iron formula that combines strength with high temperature resistance. They improve quality and reduce rejects, too, because they're designed for even heat distribution without hot spots. If you melt any non-ferrous metals, take advantage of our more than 30 years' experience in this field. It's your assurance of consistent high quality in Acme melting pots and ingot molds . . . designed *by* foundrymen, *for* foundrymen.

Quick delivery anywhere in the United States.
Write for size list showing 40 standard sizes.

Acme FOUNDRY CO.

2502 22nd St. • DETROIT 16, MICH. • *Phone* TAshmoo 5-2404

flare fittings, pipe fittings, tube benders, and other hydraulic components.—**Lenz Co.**, Box 1044, Dayton 1, Ohio.

For More Details Circle No. 418—Page 53

Flexible Hose and Duct

Specifications, selection data, and prices for flexible hose and retractable duct are given in Bulletin 83 dealing with air handling and Bulletin 84 dealing with fume control.—**Flexaust Co.**, 100 Park Ave., New York 17, N. Y.

For More Details Circle No. 419—Page 53

Conveyors

Catalog 600 describes magnetic elevator, chain-tube conveyor, piano hinge steel belt conveyors, vibrators, vibrating conveyors, and custom-built conveyor equipment.—**Prab Conveyors Inc.**, 30121 Groesbeck Highway, Roseville, Mich.

For More Details Circle No. 420—Page 53

Wood and Metal Saws

Saw specifications and descriptive data on wood and metal cutting applications are given. Catalog SP-110-57A deals with metal cutting, and Catalog SP-2-58 covers wood cutting.—**DeWalt Div., American Machine & Foundry Co.**, Lancaster, Pa.

For More Details Circle No. 421—Page 53

Constant-Speed Motors

Bulletin GEA-6814 describes design features, construction, and applications of constant-speed motors for commercial and industrial use.—**General Electric Co.**, Schenectady 5, N. Y.

For More Details Circle No. 422—Page 53

Grinding Wheels

Brochures give sizes and other specifications for the company's wheels for surface grinding, cylindrical grinding, and snagging.—**Simonds Worden White Co.**, 1108 Negley Place, Dayton, Ohio.

For More Details Circle No. 423—Page 53

Cutting Torches

Cutting torches and tips, welding torches and tips, regulators, and welding and cutting accessories are presented in Catalog 586.—**Harris Calorific Co.**, 5501 Cass Ave., Cleveland 2, Ohio.

For More Details Circle No. 424—Page 53

Epoxy Cement

Data on epoxy resin aluminum cement, how to use it, and typical applications are contained in bulletin.—**Smooth-On Mfg. Co.**, 572 Communipaw Ave., Jersey City, N. J.

For More Details Circle No. 425—Page 53

Silicon Carbide

Technical bulletin deals with a steel-packaged silicon carbide addition for cupola iron.—**American Metallurgical Products Co.**, 3600 Forbes Ave., Pittsburgh 13, Pa.

For More Details Circle No. 426—Page 53

Electronic Air Cleaners

Bulletin 258A explains the electronic principle of operation, describes collector cell construction, and gives details on basic design features. Specifications, ship-

Liquid Assets . . . Channel With Care!

Defective molds mean defective castings. But you can always be sure of fewer rejects with your molds gliding smoothly to the pouring zone over quality engineered, ruggedly built Logan Conveyor lines.

Every Logan Foundry Conveyor System is custom-made for the loads it must handle, the jobs it has to do—from core line to shipping. Whatever the capacity range and special requirements, each part of your Logan Conveyor gives you exactly the tough dependability you need, at the lowest feasible cost.

Place your problem with confidence in the hands of the highly talented Logan field engineer. He is trained and equipped to focus the whole of Logan's two generations of experience squarely on your needs—more successful installations than any other conveyor company can draw upon. Logan takes full responsibility for your custom-created conveyor, from design to guaranteed smooth operation. Call or write us today for a visit from "The Man from Logan" stationed in your area.

Logan Conveyors

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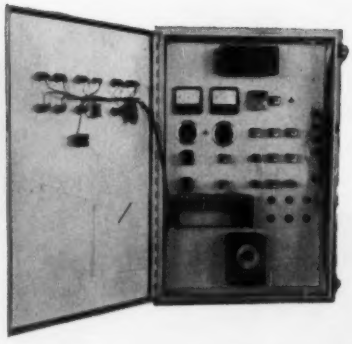
Circle 652 on Page 53

HARTLEY
HYGRO-GUIDE
SERIES XII
$2995.00
COMPLETE



Here's Your Bargain Buy in FULL MIXING AUTOMATION!

Series XII Automatic Sand Moisture Control with Hartley Electric Time Guide operates any new or old batch type mixer—brings the accuracy, speed, economies and product improvement of automation within the reach of any foundry.

Single probe in mixer controls water as indicated by temperature and moisture of return sand. Can't double-batch! Other advantages include: Accessible and instant moisture adjustment . . . plug-in mounted relays . . . finger-tip mulling cycle regulator . . . cam operated timer with 12 stations.

Accurate—foolproof—easy to install and maintain—the Hartley Hygro-Guide Series XII comes complete in NEMA type 12, 30" x 42" x 8" cabinet, which may be located any distance from mixer.

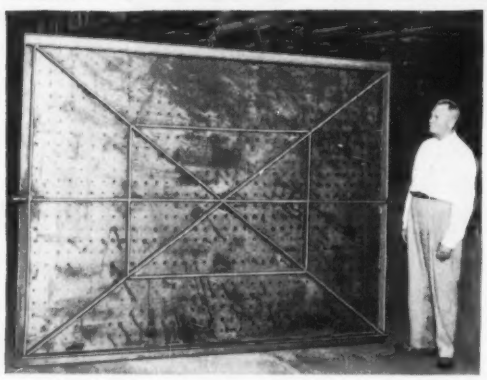
Full particulars sent promptly on request.

HARTLEY *Controls* CORPORATION

Neenah • Wisconsin

Circle 653 on Page 53

HERE'S "TOPS" in BOTTOM BOARDS



Mighty BIG is this Sterling-made Bottom Board, and mighty well engineered . . . as all Sterling Core Plates and Bottom Boards are . . . to prevent warping or twisting. All welded steel heavy reinforcing angles and bars assure maximum strength and rigidity. This big bottom board suggests the versatility of Sterling foundry equipment engineers. Another reason why Sterling is "TOPS" in this field.

STERLING MAKES THEM THE WAY YOU NEED THEM

Standard Core Plate and Bottom Board Styles are available in various sizes. Special designs, including round bottom boards, can be made to meet your needs. *Write for Catalog.*

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Founded 1904 as Sterling Wheelbarrow Company

Sterling FOUNDRY EQUIPMENT

A-8143-½R

ping weights, capacities, and dimensions are listed.—**American Air Filter Co.**, Louisville 8, Ky.

For More Details Circle No. 427—Page 53

Welding Equipment

Brochure evaluates 50 important design features found in oxyacetylene welding and cutting equipment and industrial regulators produced by 19 leading manufacturers.—**Modern Engineering Co.**, 3411 Pine Blvd., St. Louis 3, Mo.

For More Details Circle No. 428—Page 53

Aluminum Alloy

Design specifications, mechanical properties, and casting technique for TENS-50 high strength aluminum casting alloy are contained in a brochure.—**Navan Products Inc.**, International Airport, Los Angeles 45, Calif.

For More Details Circle No. 429—Page 53

Motor-Driven Cranes

Bulletin DH-227-B deals with the company's B-516 underhung, single bridge, motor-driven cranes. Construction details, including weights, dimensions, and other data are included.—**Wright Hoist Div., American Chain & Cable Co.**, York, Pa.

For More Details Circle No. 430—Page 53

Graphite Dispersions

Vol. 4, No. 1 of *The Acheson Dag Disperser* includes descriptions of colloidal and semicolloidal graphite dispersions for lubricating diecasting molds and core oven car wheel bearings.—**Acheson Colloids Co.**, Port Huron, Mich.

For More Details Circle No. 431—Page 53

Testing Laboratory

Brochure describes facilities and services of a completely integrated independent commercial testing laboratory.—**New York Testing Laboratories Inc.**, 47 West St., New York 6, N. Y.

For More Details Circle No. 432—Page 53

Feeder Valves

Bulletin 24-D provides details on design and application of rotary vane valves as feeders, airlocks, or explosion checks.—**Sprout, Waldron & Co.**, 130 Logan St., Muncy, Pa.

For More Details Circle No. 433—Page 53

Flexible Couplings

Catalog 67 gives specifications and ratings on flexible couplings to accommodate 1¼, 1¾, 2¼, and 2¾-in. maximum bores.—**Ajax Flexible Coupling Co.**, Westfield, N. Y.

For More Details Circle No. 434—Page 53

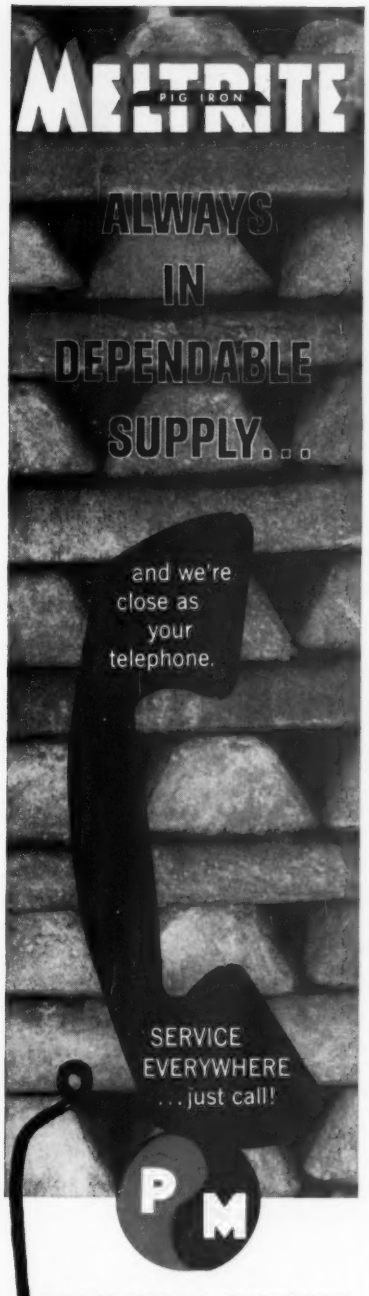
Ladles and Skimmers

Stainless steel ladles and skimmers for handling nonferrous alloys in diecasting operations are covered in leaflet.—**Spincraft Inc.**, 4141 W. State St., Milwaukee 8, Wis.

For More Details Circle No. 435—Page 53

Fork Lift Trucks

Three literature pieces deal with fork lift trucks. BU-302A gives specifications on complete line of trucks in capacities from 2000 to 10,000 lb. BU-452 reviews



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Circle 655 on Page 53

engineering features of the trucks. BU-453 gives engineering data on the 2000-lb capacity model.—**Engine-Material Handling Div., Allis-Chalmers Mfg. Co.,** Milwaukee 1, Wis.

For More Details Circle No. 436—Page 53

Electric Hoists

Circular 166 gives specifications and describes features of a line of electric hoists in capacities from ⅛ to 2 tons.—**Chisholm-Moore Hoist Div., Columbus McKinnon Chain Corp.,** Fremont Ave., Tonawanda, N. Y.

For More Details Circle No. 437—Page 53

Grinding Wheels

Booklet describes grinding wheel characteristics and includes an extensive table of wheel recommendations for various materials and jobs.—**American Emery Wheel Works,** Providence, R. I.

For More Details Circle No. 438—Page 53

Duplicate Patterns

Technical Data Bulletin T24A describes plastic tooling foundry equipment for duplicating master patterns, models, or sample parts.—**Tooling Div., Houghton Laboratories Inc.,** Olean, N. Y.

For More Details Circle No. 439—Page 53

Crane

Construction details and recommended applications for a low-cost crane available in capacities of 20, 25, and 30 tons are given in Bulletin 91.—**Whiting Corp.,** 157th & Lathrop Ave.. Harvey, Ill.

For More Details Circle No. 440—Page 53

Soldering Aluminum

Booklet covering the soldering of aluminum includes data on fluxes, irons and flames, and various soldering methods.—**Reynolds Metals Co.,** Dept. PRD-6, Box 2346, Richmond 18, Va.

For More Details Circle No. 441—Page 53

Sand Conditioner

A case study file describes "How Foundry with Floors for 20 Molders Saved $8300 a Year on Sand Preparation."—**States Engineering Corp.,** 245 E. Murray St., Fort Wayne, Ind.

For More Details Circle No. 442—Page 53

Conveyors

Specifications, load ratings, dimensions, and construction data on roller and wheel conveyors and frames are given in Catalog 158.—**Mathews Conveyer Co.,** Ellwood City, Pa.

For More Details Circle No. 443—Page 53

Crane Scale

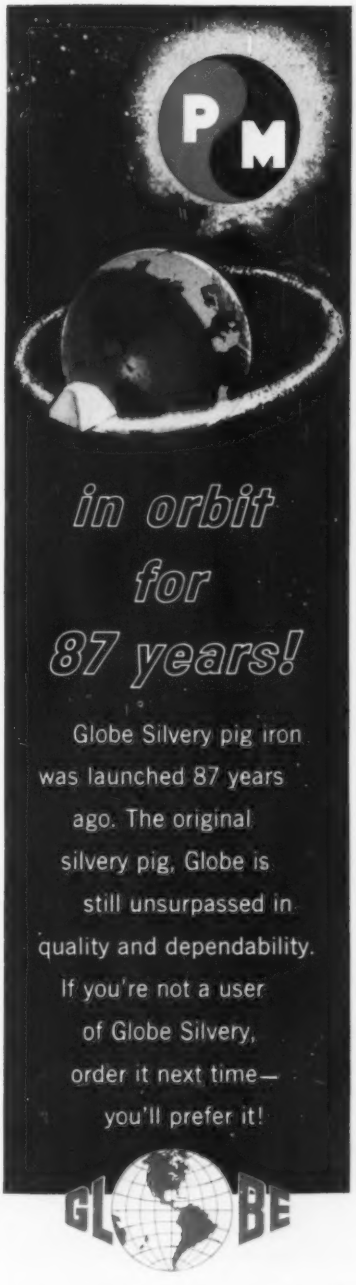
Hydraulic crane scale available in capacities of 1000 to 20,000 lb is described in Bulletin M-25.—**Martin-Decker Corp.,** 3431 Cherry Ave., Long Beach 7, Calif.

For More Details Circle No. 444—Page 53

Grinding Wheel Safety

Ten "dos" and ten "don'ts" of grinding wheel safety are listed on a red, white, and black, 12 x 12-in. wall chart.—**Carborundum Co.,** Niagara Falls, N. Y.

For More Details Circle No. 445—Page 53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87 years!
Globe Silvery pig iron was launched 87 years ago. The original silvery pig, Globe is still unsurpassed in quality and dependability. If you're not a user of Globe Silvery, order it next time— you'll prefer it!
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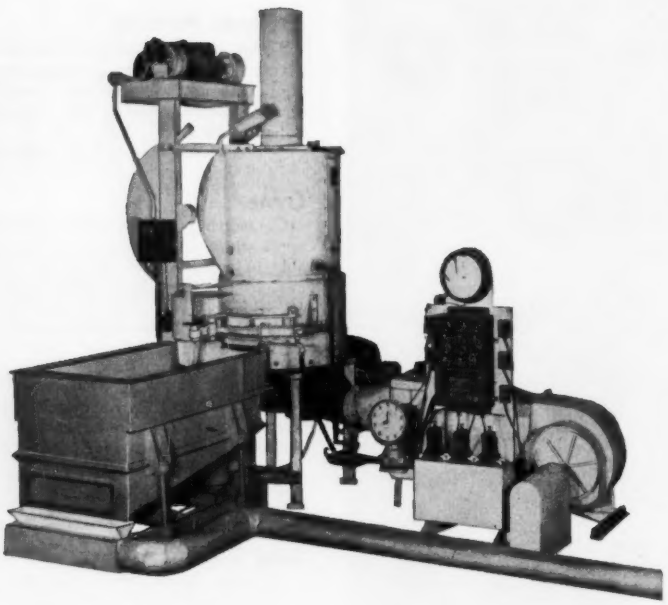
Circle 656 on Page 53

COMPARE

the one shell sand coating unit that

HANDLES ALL PROCESSES

HOT!
COLD!
WARM!
NOVOLAK!



30-50 HP Shell Sand Speedmullor with steam heating unit.

THE HP SHELL SAND SPEEDMULLOR

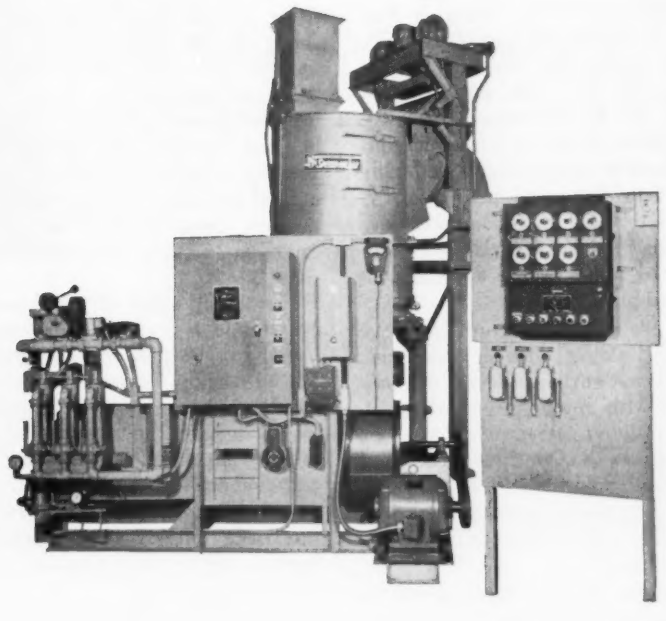
Speedmullor-coated sands cut resin costs by up to 50%, improve sand properties and casting quality. These sands end the dangerous dust hazard of uncoated mixtures and do not deteriorate in storage. No wonder that progressive foundries everywhere accept Speedmullor-coated sands as the standard of the industry. But—resin coating is accomplished by a number of different processes—and each has certain advantages. Most coating units are single-purpose —designed for only one process. *Only the HP Shell Sand Speedmullor coats sand by all known processes.*

COMPARE FLEXIBILITY

In the fast-developing, fast-changing shell processing field—and especially in shell sand preparation—processes change rapidly. New processes obsolete old . . . and can also obsolete inflexible equipment—designed for the old process alone. Without exception, competitive units have been designed to handle only one process . . . they are single-process units. Only the HP Shell Sand Speedmullor handles every one of the shell coating processes—hot, cold, warm or Novolak. Only this unit offers "flexibility insurance."

COMPARE PERFORMANCE

Maximum physical properties—minimum resin content—uniformity—uniform melt points—stability—flowability—moldability—these are the criteria of performance of shell sand coating equipment. In every one of these the HP Shell Sand Speedmullor excells—voids, porosity, blows and gas holes are eliminated. Not only that, but Shell Speedmullor cycles are faster—in some cases up to three times as fast. Speedmullor-coated sand is of maximum density, free-flowing, non-clumping and uniformly coated.



30-50 HP Shell Sand Speedmullor with gas heating unit.

BEARDSLEY & PIPER

Div. Pettibone Mulliken Corp.,
2424 N. Cicero Avenue
Chicago 39, Illinois

The only complete line of shell sand coating equipment.

THE SHELL MULBARO
—for lowest cost cold process coating.

THE SHELL MULL-ALL
—the complete economy package unit for cold or warm process coating.

THE CP SHELL SPEEDMULLOR
—for highest capacity cold process and warm process coating.

THE HP SHELL SPEEDMULLOR
—for all processes—hot, cold, warm and Novolak.

COMPARE CAPACITY

There are two HP Shell Sand Speedmullors . . . the 30-50 HP and the 50-60 HP . . . with approximate batch capacities of 400 and 900 pounds . . . hourly capacities to 8000 and 18000 lbs. Competitive units—limited to a single process—offer capacities of only about half that of the 30-50 HP. Though advertised as "hot process units" these competitive mixers handle only preheated sand. *No* competitive unit offers anywhere near the capacity of the larger HP unit. The foundry equipped with an HP Shell Speedmullor has all of the advantages of maximum capacity from each square foot of floor space, and from each dollar invested.

COMPARE COST

HP Shell Sand Speedmullors *do much more but cost no more.* A Model 30-50 HP Shell Speedmullor costs approximately the same as a competitive unit with only about half of the Speedmullor's capacity. Yet, the HP unit handles every known process, while the competitive unit is a single-purpose machine.

Circle 657 on Page 53

F

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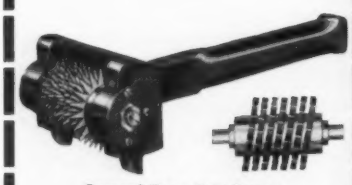
Desmond Hex Dresser

LIVES FOR FOUNDRY GRINDING WHEEL



Desmond Heavy Duty Dresser

DRESSERS

Cut grinding and snagging costs with inexpensive Desmond Hex dressers. They bring grinding wheel faces to "new" efficiency by removing loaded metal and exposing sharp abrasive grains. And Hex dressers provide **six** sets of bearings in one set of bearing blocks . . . for extra life on average wheels. For resinoid and rubber bonded high-speed wheels use the ball-bearing Desmond Heavy Duty Dresser. Ask your Desmond distributor's advice.

Desmond

Desmond-Stephan Mfg. Co.
Urbana, Ohio

Circle 658 on Page 53

The Sandman Says

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

"Mulling Over Some Ideas"

● THE LATE Dr. Heinrich Ries was one of my most influential advisors. I knew him only toward the latter part of his life, but advanced years and his enthusiasm in assisting others toward a higher interest in foundry sand control seemingly served to strengthen his joy of living. Dr. Ries, in my opinion, was a foundryman's scientist who contributed much to the advancement of sand practice.

In his search for truth he spoke quietly, almost with a philosophic calmness, but he never compromised with any degree of falsehood. If he didn't agree with you, he would say so, unequivocally. But he also would insist that you make your position entirely clear so that a more logical form of reasoning might prevail.

He was kindness and gentleness personified. Whenever I hear the word 'Gentleman' I think of Dr. Ries. His letters to me were always thought provoking and helpful. He often quoted an emotional outburst of mine and then explained in detail why he believed I was wrong. His reasoning was completely convincing, and I was not likely to make the same mistake again.

This leads me to the thought that prompted the foregoing. To wit: I have never learned anything from a man who consistently agreed with me. I have learned a great deal from those who didn't, especially if they had the inclination and courage to clarify their objections so that they were understandable to a mentality such as mine.

I recently met Otto H. Rosentreter, an old friend from Los Angeles, who has forgotten more about foundry sand than I'll ever know. After exchanging the usual perfunctory greetings, he told me that he had formed the questionable habit of reading my column regularly. Then, after a pregnant pause, he said, "Some of it I like, but I can't agree with everything you write."

I probably think of those words every time I put a sheet of paper into my typewriter, and I am grateful for Otto's frankness. But why did he wait so long before telling me? I wonder how many of my other readers feel exactly as Otto does and are just too busy (or lazy) to tell the old sandman how far he has gone out on that proverbial limb?

The Discarded Sample—A recent technical article was devoted to explaining how core oil can be tested and evaluated. The author used some 1200 or 1500 words of text and several interesting graphs to support his hypothesis that the simple tests he described would serve the foundryman in his selection of an oil that will do all of the things required in a particular practice.

Although I am no judge of core oils, I do believe that this young author has done a commendable job of research and experimentation and has expressed himself in language that is unmistakably clear. Any darned fool, however, can criticize the best article ever

OUR experienced engineers are available to make practical suggestions on the efficient operation and maintenance of your equipment.

Our simple daily cost record determines the most efficient type of abrasives for you to use, and equally important, proves the kind of economies Cleveland Metal Abrasive can offer.

Many customers are already using the Cleveland cost system. Write us today for more information, together with new catalog No. 159, or call our nearest representative.

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4. "A" Iron	5. Hi-Strength "B"	6. Chilled Iron	7. Cut Wire

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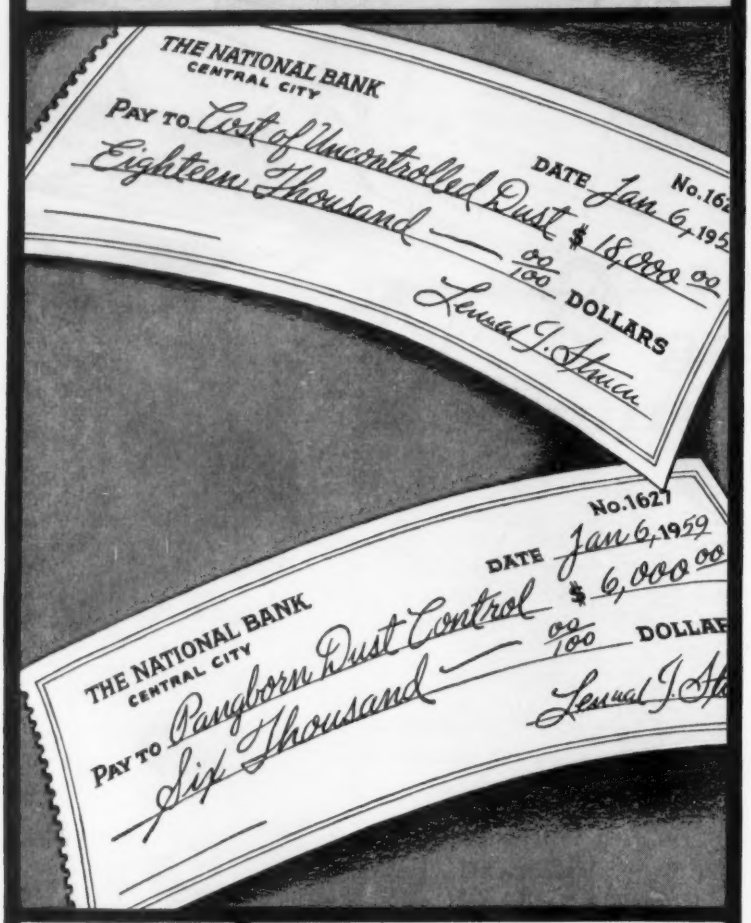
World's Largest Production Capacity

Circle 659 on Page 53

WHICH CHECK WOULD YOU RATHER WRITE?



How much are you paying for uncontrolled dust?

See for yourself—add up the cost of your lost salvageable material, housekeeping expenses, excess machine wear, intangibles such as community and employee goodwill. Whether your total is moderate or high, Pangborn Dust Control will cost you *less* than uncontrolled dust.

For details on Pangborn's engineering knowledge and experience, talk to the Pangborn man in your area or write PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Maryland. *Manufacturers of Dust Control and Blast Cleaning Equipment — Rotoblast® Steel Shot and Grit.*

Pangborn CONTROLS DUST

written, (a dog can bark at a king); so I hope the young man will excuse the impudence of an older man who seeks to pick at what he considers to be a flaw in an otherwise excellent treatise.

The author describes a test batch (4500 grams) of core sand, mulled according to the best standard practice in a laboratory muller. He suggests that 25 test cores be made (tensile) and that these be baked for various periods at 450° F.

"After baking," he says, "each group of cores is checked for tensile strength (five cores from each time cycle). The tensile strength of each group of cores is totaled. This reckoning gives the total combined strength of five cores. If any *one* reading in a group of five is *inconsistent* when compared with the other four, this figure should not be used in the test result."

I assume that the foregoing is considered correct practice in a laboratory, but how about the sample which proved inconsistent and was discarded? What portion of the mulled batch was represented by this oil-starved or oil-glutted sample?

And yet again, suppose that you were making a 1000 or 2000-lb batch under production conditions, which are not expected to be as closely controlled as in the lab. How much of this sand would approximate the condition of the discarded lab sample?

In discarding a portion of a batch of sand, we indicate our belief that it is unsuitable for molding purposes, that it is prone to result in defective castings. Perhaps we'd better blame our mulling practice, not the oil or the technician. (End of bark.)

Insulation—To the man or men who first recognized the need for more effective riser insulation, I bow in profound gratitude. He or they have reduced unnecessary human perspiration by at least a million gallons.

Old men, with short memories and an exaggerated estimation of everything connected with the "good old foundry days," conveniently forget the long hours of "churning" and supposed feeding

of molten iron into a heavy casting

They forget the holes, distortion, and inclusions that resulted from much of this inept so-called feeding. They forget the swells, knots, blows, blisters, and wash caused by their good old, naturally bonded sand. We should pause to thank some unrecorded benefactors for synthetic sand mixtures and for riser insulation, which have minimized most, if not all, of those deplorable conditions!

In this connection, I am reminded of a West Coast foundry which for more than 50 years has been producing 7-ton sulfur retorts for a large chemical company. For the first 35 years, some 12 to 15 of these castings were required annually, and each of those castings had a service life of from one to two months

During the last 15 years, largely because of improved metallurgy, service life has been extended to 10 and even 12 months, at a very moderate increase in cost. During this latter period, the chemical company's business has enjoyed phenomenal growth while casting orders for the foundry have declined by 50 per cent.

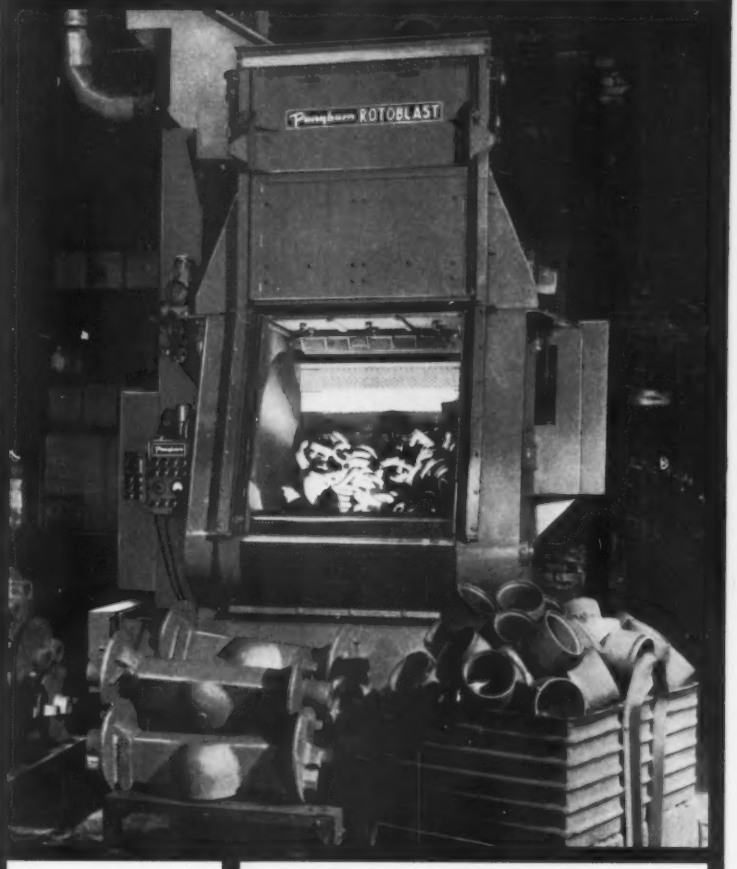
Better Castings Pay

Does it pay to make better castings? I believe that it does. An improved product should produce satisfied customers and extend both the actual and potential market for foundry merchandise. But, as usual, I deviate.

My subject was riser insulation and exothermic reactors, or hot topping—call them what you will. These heat generators and heat retainers have proved worth their weight in something even more valuable than gold, for they have saved the foundry incalculable wealth and have advanced our dignity beyond measure.

Synthetic (formulated) molding sand has proved even more valuable than these insulators in the production of heavy castings, for by its use we are able to produce molds and cores in considerably less time, with less effort, less loss, and lower cost, with casting results that defy comparison with the older product. Progress in foundry practice has ceased to be a frustrating dream!

CUTS MAN-HOURS 38%



Pangborn Rotoblast cuts man-hours per day from 24 to 15 at Meadville Malleable Iron

The investment in a new 20 cu. ft. Pangborn Rotoblast Barrel has really paid off for Meadville Malleable Iron Co., Meadville, Pa.! By switching from a competitive barrel of about 12 cu. ft. capacity, the firm now cleans loads three times as large in half the time. Today tote box loads averaging 1900 lbs. each are cleaned in 4—5 minute cleaning cycles. As a result, the Rotoblast Barrel has cut 24 man-hours per day to 15 man-hours in the cleaning department and greatly improved the quality of the work.

How much time and money can Pangborn Rotoblast save you? It would pay you to talk to the Pangborn man in your area. Or write PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning and Dust Control Equipment.*

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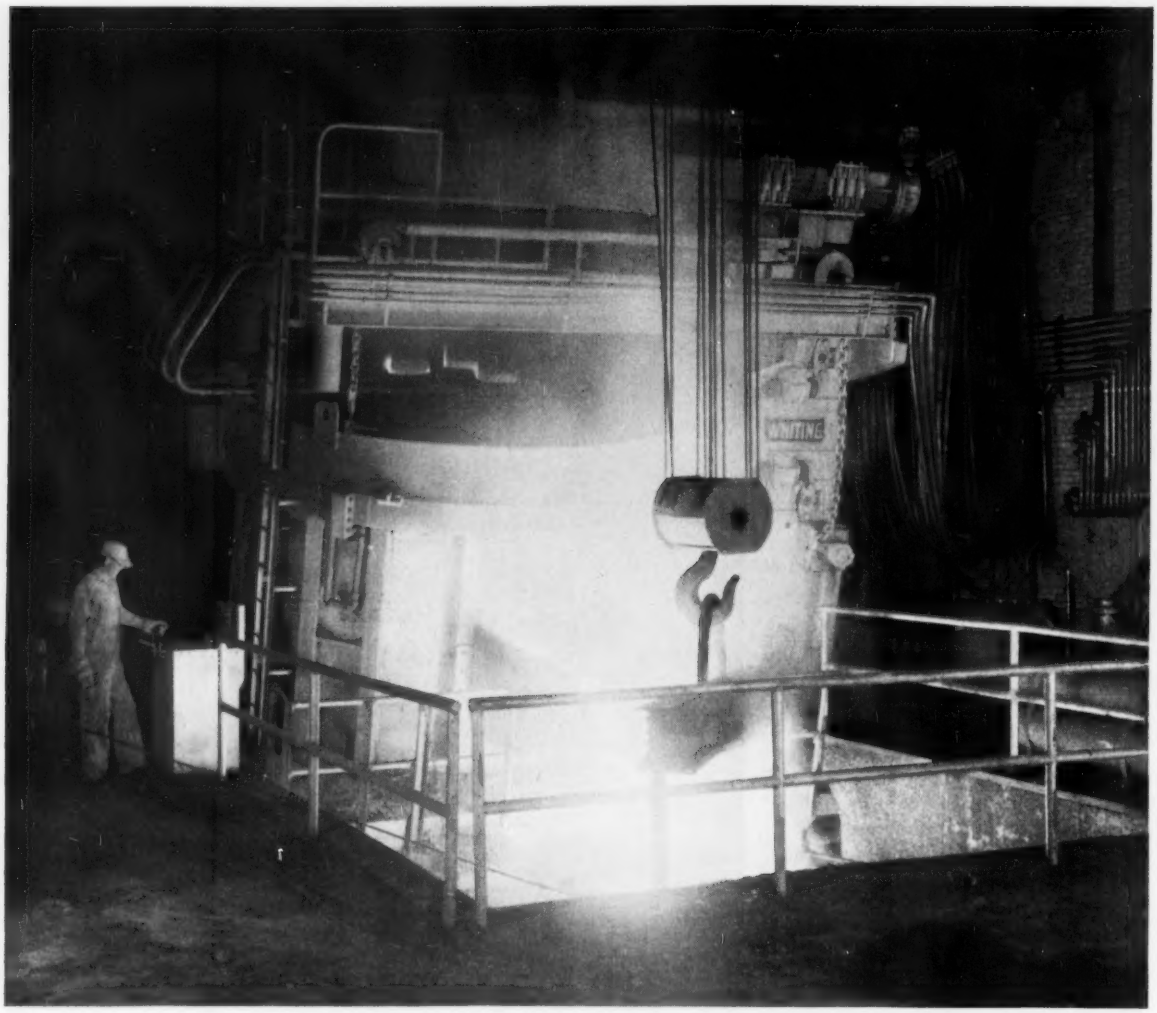
CLEANS IT FAST WITH ROTOBLAST®

Circle 661 on Page 53



Hydro-Arc Speeds Texas Steel Production

Steel costs *can* be cut, by converting local scrap on the spot. Texas Steel Co. of Fort Worth, for example, now operates a 20-ton capacity Whiting Hydro-Arc electric furnace to produce billet-sized ingots ready for rolling. The very high efficiency of Hydro-Arc makes even medium or small scale operation profitable. This 12 foot 6 inch furnace energized with 7500 KVA substation equipment produces 23½ ton heats every 100 minutes. Whiting's superior electrode positioning control *constantly* keeps *proper* arc adjustment. Arcs burn at peak efficiency every moment. This means more heats per day at less cost.

An electric conversion installation can be surprisingly low cost, and highly profitable. For the full story, write for the Whiting Hydro-Arc Catalog, number FY-168. *Write today.*

The Whiting Corporation, 15607 Lathrop Avenue, Harvey, Ill.

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MANUFACTURERS OF CRANES; TRAMBEAM HANDLING SYSTEMS; TRACKMOBILES; FOUNDRY, RAILROAD, AND CHEMICAL PROCESSING EQUIPMENT.

Castings Progress Reviewed at . . .

AFS TECHNICAL SESSIONS

Nearly 200 persons heard a talk on shell coreboxes at the first pattern session

INTEREST in the many new developments which have been taking place in the foundry industry in recent years helped to swell attendance at technical sessions of the recent AFS Castings Congress in Chicago.

This interest also was reflected in the extent of discussion and number of questions asked at the conclusion of the paper presentations at many of the meetings. In some instances only lack of time prevented a continuation of the discussion.

Sessions at which various phases of the CO_2 process, shell molds and cores, new pattern materials, and quality control were subjects attracted the greatest interest. Roundtable luncheons sponsored by the various divisions included live topics in their programs and were well attended. Growing participation of foundries in diecasting work was indicated by the larger audiences at sessions devoted to this subject compared with those of previous years.

Summaries of papers given at sessions on light metals, malleable iron, patterns, brass and bronze, industrial engineering and costs, management, and safety, hygiene and air pollution are presented on the following pages. Reports on other sessions will be published in the June issue.

PATTERNMAKING

● EXCELLENT attendance marked the three technical sessions and the roundtable luncheon presented by the Pattern Division. Subjects covered included shell cores, CO_2 patterns and cores, new pattern engineering materials, and plastic pattern equipment.

Coreboxes for Shell Cores by J. E. Stock, John Deere Waterloo Tractor Works, Waterloo, Iowa. Shell core machines and coreboxes must be selected to fit given needs. Any corebox metal can be used, but Deere had trouble with warpage in aluminum boxes and now uses cast iron, which also provides better heat transfer. About 50 per cent of the company's cores at Waterloo now are shell cores, made on four six-station, one two-station, and one one-station units.

In high production, ejection pin systems are important. Cores some-

times can be made with from ½-degree to no draft. Venting also is important. This plant has discontinued use of screened vents. Instead, holes, usually about ⅜ in. in diam, are drilled, and square pegs are inserted. At parting sections, slots are milled to ½-in. out of the cavity, and a hole is drilled at that point.

Boxes are made by the company's "cast-to-size" process in dry sand with zircon facing. Pencil gates on ½-in. centers are used, and metal is poured at 2400° F. Uniform heating of boxes is needed to produce uniform cores. Boxes are normalized 7-8 hr at 950-1100° F, one to three times depending on size, to avoid distortion during machining.

A movie, "Plastic Tooling and Patternmaking with Epoxical Resins," also was presented at the first session.

New Horizons in Pattern Engineering Materials by J. E. Olson, Dike-O-Seal Inc., Chicago. New pattern products include a patching material which is applied in plastic form, and an abrasion-resistant "plastic rubber" for green sand, CO_2, and self-setting process patterns and coreboxes.

The latter material also is used for blowtubes, inserts, and matchplates. It is said to extend pattern life, lower repair and downtime costs, and in general to possess great strength and toughness.

Other new products include vents, pilot pins and bushings, soft-faced hammers and mallets, and more items for the pattern shop.

Construction of and Materials for CO_2 Pattern and Corebox Equipment by R. J. Carver, Carver Foundry Products Co., Muscatine, Iowa. Successful blowing and shooting of CO_2 cores requires proper attention to corebox design, seals, venting, and gassing arrangements. Stacked CO_2 shell molds also are being made successfully in some plants and offer advantages for some types of production.

Use of as little binder as possible is important because 50 per cent or more of the binder is moisture. This moisture creates steam and also causes storage problems. Properly made cores can be stored indefinitely. The worst single practice in manufacture of CO_2 cores is overgassing, which costs money, slows production, and hurts quality. Number, size, and location of vents must receive close attention. Heating CO_2 before gassing reduces freezing problems and cuts gas consumption about 30 per cent.

"From the size of those clayballs, I'd say the sand mixer is in for an overhaul"

Rigging Coreboxes for High-Production Core Practice by W. H. Miller, Ford Motor Co., Cleveland Foundry Div., Berea, Ohio. All facilities should be acquired as part of the whole setup, and all parts must work together effectively.

Ford has developed a successful blow bushing for its own use which is made of cold rolled steel with a stainless steel liner. Corebox wear must be watched in three spots: Vertical sidewalls adjacent to blowhole, restricted passages, and the area under the blowhole. Beryllium copper inserts are helpful with the restricted passages. To avoid wear under blowholes, boxes can be designed with an area where sand pushed into a recess receives the impact of the blow.

Sheet screens often can solve difficult venting problems. Decisions as to how many screens to use and at what places must be made on an individual basis.

A "shear bushing assembly" can be used to protect coreboxes from damage in the event that a coreblower operates out of cycle. The bushing is sheared off, the machine stopped, and the bushing replaced in about five minutes.

Ford has had good experience with magnesium coreboxes.

Consulting Service on Pattern and Corebox Equipment Problems—panel discussion by M. K. Young, U. S. Gypsum Co., Chicago; R. L. Olson, Dike-O-Seal Inc., Chicago; J. F. Roth, Cleveland Standard Pattern Works, Cleveland; R. LeMaster, R. A. Nelson Pattern Co., Milwaukee; W. E. Mason, Westinghouse Air Brake Co., Wilmerding, Pa.; and speakers from other pattern sessions. Many points were covered on the basis of questions from the audience. They included the following:

As yet, no satisfactory plastics have been developed for shell patterns, but work in progress shows promise. Such plastics need both heat resistance and conductivity. Some now have the heat resistance, but they require about a three-minute dwell time because of low conductivity.

Plastic plates should be about double the thickness of aluminum plates because of plastic's lower modulus of elasticity.

It is preferable to decrease the size of blowtubes and to use more of them than to use fewer large ones. Use of many small tubes decreases wear.

For shell, cast iron coreboxes are preferable to those of magnesium.

Good alloys for driers are 355 or 356 aluminum heat treated to the T6 condition. Stabilization is difficult because they go through the heat treat cycle each time they go into the oven. It's wise to have coreboxes and driers marked so that the alloy of which they're made is always certain.

Lumber for wood patterns must be selected and handled carefully. It also should be stored for as long as possible in the pattern shop to acclimatize it.

Patternmakers need to be progressive. They must make better equipment at lower cost so that everyone involved will be better off. Patternmakers should help foundrymen because there is no need for patterns unless castings are being sold.

Pattern Division Luncheon—At the pattern roundtable luncheon, F. B. Porzel, Armour Research Foundation of Illinois Institute of Technology, Chicago, spoke on "Atomic Blast—A Pattern for Survival." In this case the word "pattern" had a different meaning from that known to the patternmaker and foundryman. It is not an ex-

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	FOUNDREZ 7600, 7601, 7605	LIQUID AMINO CORE BINDING RESINS	RAPID COLLAPSIBILITY FAST BAKE — LESS SMOKING
	CO-RELEES 7300	LIQUID SAND CONDITIONER	EXCELLENT SAND WORKABILITY
	coRCIment 7990, 7991, 7992, 7993	LIQUID OLEORESINOUS CORE BINDERS	BROAD BAKING RANGE
	FOUNDREZ 7150, 7151	LIQUID PHENOLIC RESINS FOR SHELL COREMAKING	UNUSUAL STABILITY
	FOUNDREZ 7500, 7504, 7506, 7555	POWDERED PHENOLIC RESINS FOR SHELL MOLDING	SELF-ACTIVATION
	FOUNDREZ 7520	GRANULATED PHENOLIC RESIN FOR SHELL MOLDING	HIGH TENSILE STRENGTH
	COROVIT 7201, 7204	POWDERED ACCELERATORS FOR COROVIT OILS	NON-TOXICITY
	COROVIT 7202, 7203	LIQUID BINDERS (SELF-CURING)	EXCELLENT FLOWABILITY
STEEL STAINLESS LOW CARBON HIGH CARBON	**FOUNDREZ** 7104	LIQUID PHENOLIC CORE BINDING RESIN	EXCEPTIONAL STABILITY HIGH HOT STRENGTH HIGH BAKED STRENGTH
COPPER ALLOYS BRASS BRONZE	**FOUNDREZ** 7605	LIQUID AMINO CORE BINDING RESIN	FAST BAKE LESS SMOKING
LIGHT ALLOYS ALUMINUM MAGNESIUM	**FOUNDREZ** 7605	LIQUID AMINO CORE BINDING RESIN	RAPID COLLAPSIBILITY

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aggeration to state that those who heard Mr. Porzel speak on the catastrophic consequences of an atomic blast were appalled, and now recognize the necessity for an adequate and workable plan for survival.

The speaker pointed out that the government is appropriating 1000 times the money for methods and implements of war that it is for civil defense. In his opinion, not enough funds or emphasis are being given to civil defense.

Mr. Porzel described the explosive force of an atomic bomb. For some of the population, there would be no time to seek shelter, but for most there would be enough warning. He described the need for shelters, mostly in the home, and the proper equipping of these with supplies to sustain life. The grimmest phase of his presentation was that which dealt with the need for fast action to insure the survival of the human race.

LIGHT METALS

● TEN TECHNICAL papers and a luncheon session were presented by the Light Metals Division. Subjects included a mold material for titanium; solidification principles; a discussion of the value of test bars; hot cracking; ultrasonic and bending tests; a new magnesium alloy; gas measurement in aluminum, and design engineering.

Effect of Starch Content on a Rammed Graphitic Mold Material for Casting Titanium by H. W. Antes and R. E. Edelman, Frankford Arsenal, Philadelphia. Presented by Mr. Antes. Rammable graphitic mold material consists of powdered graphite, carbonaceous cement, starch, powdered pitch, a surface activating agent, and water. Previous studies showed that optimum water content is 6 per cent and minimum molding pressure, 100 psi.

The best combination of mold properties results with 6 to 8 per cent starch content. That amount of starch and a 120 psi molding pressure provide molds equivalent to machined graphite molds with respect to minimizing surface contamination of titanium castings. Starch content may be increased to 8 per cent to facilitate removal of complex patterns without damaging the mold.

Some Principles for Producing Sound Al-7 Magnesium Alloy Castings by W. H. Johnson and J. G. Kura, Battelle Memorial Institute, Columbus, Ohio. Presented by Mr. Johnson. Purpose of the investigation was to learn if solidification curves of steel would apply to this magnesium alloy. The work involved investigating the effect of riser position, single and multiple gates, gate location, and the location of chills. The test castings were bars and plates, and thermocouples were used to determine thermal gradients.

Results of the study indicate that thermal gradients in excess of 5° F per inch must be present to achieve casting soundness. If casting design permits, the risers should be at the side and gated into the casting. If a top riser must be used, multiple gates should be employed.

Riser feeding range may be extended by using double taper, wedge-shaped chills placed to promote directional solidification toward the riser. Minimum thickness at the wide end of the wedge chills for plate castings should be at least equal to the section thickness of the casting.

If casting design permits placement of wedge-shaped chills on both sides of a section, such as a bar, minimum thickness of the heavy end of the chill should be one-half the thickness of that section.

During discussion it was pointed out that the solidification characteristics of this alloy might be different from those of other magnesium alloys. Also that solidification principles for steel should not be extended too far in setting up rules for nonferrous alloys. Further study might indicate that the principles are different.

The Light Metals roundtable discussion subject was **What Does the Test Bar Mean to the Producer and User of Castings?**

Test bars, whether they are cast separately, poured with the castings, or sectioned from the casting, do not indicate properties of the casting. They do, however, indicate the characteristics of the metal and the effect of heat treatment. Also, test bar data on a new metal can be useful to designers and foundrymen because it can be related to another, known metal. This will give an indication of what characteristics can be expected from the new metal. In any event, test bar data cannot be used in developing a casting design.

Casting designers prefer to use metals that have a successful history of service. Furthermore, they want uniformity in metals and in castings. It was recommended that foundries have a good quality control program and strive for trustworthiness, reliability, and uniformity in cast parts.

Correlation of Radiography, Microstructure, and Mechanical Properties of Magnesium-Thorium-Zirconium Alloy HK31A by T. R. Bergstrom and R. G. Bassett, Boeing Airplane Co., Seattle. Presented by Mr. Bassett. Specimens were cut from a power-pack door panel casting and tensile tested at room temperature and at 500° F. Autoradiographs, radiographs, micrographs, and spectrographs were made to investigate variations in composition and associated effects.

The x-ray indications were caused by segregation. Segregation affected microstructure, and severe segregation lowered mechanical properties. Although sections deficient in alloying elements had normal room temperature properties, elevated temperature mechanical properties were reduced. Sections with high alloying element content had reduced mechanical properties at both room and elevated temperature.

Radiographic standards were established on the basis of the evaluation.

Magnesium Casting Alloy EK31-XA by K. E. Nelson, Dow Chemical Co., Midland, Mich. This comparatively new magnesium alloy contains 2.5-4.0 per cent didymium

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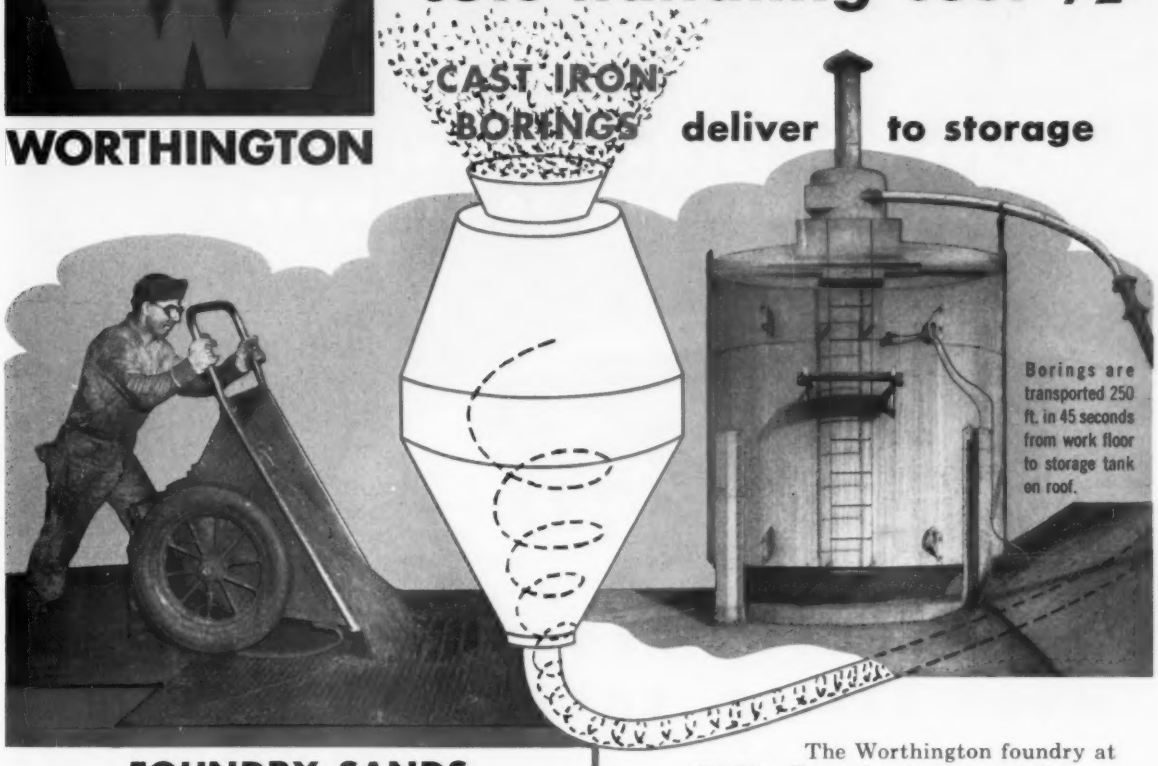

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and 0.4-1.0 per cent zirconium. When subjected to a T6 heat treatment, the alloy possesses good tensile properties at room temperature and retains these properties well at elevated temperature. It has good creep strength at temperatures up to 450° F for applications up to 1000 hours. Its creep strength at higher temperatures up to 600° F remains good for about 10 hours.

The alloy may be cast in sand or in permanent molds and rates second in castability to the Mg-Al-Zn alloys.

Hot Cracking Test for Light Metal Casting Alloys by E. J. Gamber, Aluminum Co. of America, Cleveland. U-shaped test specimens are cast in a dry sand mold, containing eight castings with variations in fillet radius or length. The castings have thin, elongated channel sections with short upright ends.

The test assesses a wide range of hot cracking susceptibility of aluminum and magnesium alloys, yet possesses good sensitivity to small differences in cracking tendency. Test results are reproducible and have shown little experimental scatter. Test ratings agree with foundry experience.

Sample for Rapid Measurement of Gas in Aluminum by H. V. Sulinski and S. Lipson, Frankford Arsenal, Philadelphia. Presented by Mr. Lipson. A constant volume sample, reduced pressure solidification test has been developed which provides within 4½ minutes a quantitative measure of the gas contained in a melt. Testing equipment is sufficiently rugged for use on the production foundry floor.

Metal samples are poured in a resin-bonded shell mold with knockoff riser system. The assembly permits close control of as-cast specimen volume.

Gas content is determined by weighing a 20-cc sample solidified at about 0.1 atmospheric pressure. Reproducibility data indicate that empirical values for gas content can be obtained with a standard deviation of 0.002 cc per 100 gr. It is believed that these values approximate the true gas content of the sample. Variance of metal sample temperatures between 1250 and 1450° F has no apparent effect on the test results.

Discussion brought forth the comment that this test is a great improvement over the reduced pressure test currently used in many foundries to determine gas content of metal.

Ultrasonic Attenuation in Cast Aluminum by H. Smolen and H. Rosenthal, Frankford Arsenal, Philadelphia. Presented by Mr. Rosenthal. This study was conducted with a commercially obtainable ultrasonic testing unit coupled to test castings through a fluid medium. The vibrations were converted to electrical impulses for registering test data.

Bar and plate test castings of 356 aluminum alloy were produced in sand molds with chills at the ends of the castings farthest from the gates. The metal for different sets of castings was degassed, untreated, or artificially gassed. Surfaces of the castings were machined and the castings radiographed for porosity. It was determined that casting density increases as the chilled edge is approached.

In ultrasonic testing, the number of echoes is greater in the metal near the chilled edge. Consequently the greater the number of echoes, the better the mechanical properties of the metal. It was concluded that ultrasonic attenuation can differentiate between good and poor quality castings.

During discussion it was pointed out that the investigators noted no effect from grain size of metal at the ultrasonic frequencies of 1 and 2.25 megacycles used in testing.

How Aircraft Designers Look at Light Metal Castings by A. R.

Castings displayed by Morris Bean & Co., Yellow Springs, Ohio, left, included the unusual, rocketlike one above. It actually is used to aid in fueling of solid-fuel rockets. Display at right was by Lynchburg Foundry Co., Lynchburg, Va.

Mead, Grumman Aircraft Corp., Bethpage, Long Island, N. Y. The author's company designs and manufactures Naval aircraft. Flight and nonflight loads to which aircraft and component parts are subjected were described as were the problems with various light metal alloys used in aircraft parts.

Additional factors of concern to designers are contained in existing specifications. These are the existing conflicts between the importance of test data obtained from separately cast test bars and test bars cut from castings and the lack of correlation between x-ray properties and mechanical properties.

The author concludes that more light metal castings will be used in aircraft if they can be developed to the point where they meet strength requirements of 60,000 psi ultimate strength, 50,000 psi yield strength, and 5 per cent elongation.

A Preliminary Appraisal of Bending Techniques for Evaluation of Cast Metals and Structures by J. C. Graddy, Douglas Aircraft Co., Santa Monica, Calif. Currently used specimens for testing mechanical properties of castings are reviewed and found wanting. It was shown that metals showing high tensile strength in these test specimens often are weaker in the final part than lower strength metal when the part has a high mechanical notch factor.

A bending test specimen was developed in this work and test results for 28 different conditions of chemistry and heat treatment in aluminum and magnesium alloys are given. The effect of geometry on bending modulus of rupture specimens of wrought materials is described, and a "shape of the curve" parameter for acceptability of bending specimens is offered.

Future work on bend testing is suggested with the comment that a proved correlation between bend specimens and static tests of cast structures will build confidence in serviceability of castings. Future specifications for high strength cast materials should include a demonstrated modulus of rupture stress as well as tensile stress. These data will help designers to use castings in more critical applications and have more efficient configurations.

Design Engineering as Related to Magnesium Castings by G. H. Found, Arthur D. Little Inc., Cambridge, Mass. A well-designed casting gives best service performance with least weight and may be cast at good production rates. The subjects of structural and casting design are discussed separately, then they are related to show that magnesium castings can and are being designed in configurations to approach the designer's ideal in design with the foundryman's ideal.

The development of a new part design, substitution design, and what constitutes good casting design and how to approach it are covered.

FOUNDRY MANAGEMENT

● THE THIRD annual management luncheon session featured a panel presentation on "So You Want To Be a President." C. E. Westover, Westover Corp., Milwaukee, chairman of the management committee, presided, and R. B. Parker, American Brake Shoe Co., New York, was moderator.

Discussing "Developing Technical Personnel," J. H. Culling, Carondelet Foundry Co., St. Louis, stressed the fact that every unit of management should have certain innovation goals and that innovation leadership is a part of the technical phase of management.

He stated that all engineering is not innovational engineering. Technical management is concerned with practical applications of scientific knowledge to routine flow and handling of materials; to the fabricating, forming, shaping, and treating of the product; and to control of product and process.

Mr. Culling also emphasized that technical management must grow and change. It should be concerned with developing whatever type of organization and managers will be needed to obtain the objectives of long-range plans of the business. Mere replacement of today's managers means stagnation. Too many young engineers find it difficult to see beyond the organization chart of today.

L. J. Woehlke, Grede Foundries Inc., Milwaukee, speaking on "Developing Operating Supervisory Personnel," pointed out that technically trained men are taking over the art in the foundry by specializing in controlling many phases of foundry operations which previously were the responsibility of the old-line operating supervisor. Foundrymen who were concerned with all phases of the casting process in the past probably will become staff technicians. This transition now is taking place in varying degrees.

In training supervisors, his company takes advantage of courses sponsored by universities, colleges, and technical and non-technical societies and associations. Supervision is selected from both plant personnel and college graduate trainees. Consulting psychologists conduct surveys of personnel to earmark candidates for future supervision training. A majority of supervisors have been promoted from the organization. Mr. Woehlke reported that the upgrading program improves employee morale and makes available the type of practical experience that cannot be obtained in any other way.

H. A. Forsberg, Foundry & Mill Machinery Division, Blaw-Knox Co., East Chicago, Ind., discussed "Developing Sales Personnel." His organization now has five young salesmen who were selected from the operating department, engineering graduate recruits, and the trade apprentice program. All have had training in the plant.

Mr. Forsberg emphasized that success of a training program depends on a top management that really wants a program and individuals who want to progress. To develop and make progress, the individual must work. All trainees are put through a 6-month program.

As it has for 30 years, the Supervisors Club of the company meets once a month, puts on its own programs and helps develop people who want to get ahead.

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neering Co., Chicago, speaking on "Developing Administrative Management," stated that every leader of a company must make a constant effort to find a substitute for himself. Too many top executives feel that finding someone to take his place will take care of itself. This attitude results in a company's losing promising young staff members.

The president of a company must fill his staff with potential presidents capable of running the company someday. Such men should have the following qualifications: 1. From 20 to 25 years younger than the existing president; 2. Possessing above all other skills, that indefinable attribute of leadership; 3. Have imagination and, to some extent, a disregard for precedent; 4. Must be inquisitive and aggressive—lean and hungry; 5. Should be lone wolves—individualists.

The chief executive typically has two types of assistants, namely staff and line. Staff officials have to do with executive planning and line officials with day-to-day operations. From the president and his assistants should come new products, new plants and production methods, and top-level research and financing ideas.

MALLEABLE IRON

● THREE malleable iron sessions and one roundtable luncheon dealt with a wide range of subjects. They included magnetic characteristics, heat treatment, casting of heavy sections, use in ordnance, controlled gating, and inspection.

At the opening session, W. K. Bock, National Malleable & Steel Castings Co., Cleveland, discussed **Malleable Iron—A Magnetic Alloy** and compared its properties with commercially pure iron, 4 per cent silicon iron, and dynamo steel.

The saturation value of malleable, while slightly lower than for the other magnetic alloys, can be compensated by increasing the cross-sectional area. Retentivity, or retained magnetism of malleable, is low. Its hysterisis loss also is low. As far as strength and hardness are concerned, all the magnetic alloys under consideration are alike, but malleable iron has the advantage of being available in cast form and easily machined.

Chemical Analysis Versus Heat Treatment Effects on Tensile Strength of Malleable Iron by J. T. Bryce, Albion Malleable Iron Co., Albion, Mich. on behalf of the Controlled Annealing Committee. Six foundries participated in the study, making test bars which were interchanged and subjected to currently operated heat treating cycles in each of the plants. Compositions and heat treating cycles varied between plants.

Conclusion was that the foundry making the particular malleable iron chose a heat treating cycle which gave the highest physical properties. The longest heat treating cycle resulted in the highest properties, while the shortest cycle gave the poorest properties. Irons with the lower carbon content gave the higher properties.

Casting Heavy Section Malleable Iron by Carl Loper Jr., University of Wisconsin, Madison, Wis. In this study, test bars 4 x 4 x 8 in. were poured from compositions ranging from 1.3 to 3.00 per cent carbon and from 0.25 to 4.00 per cent silicon.

Data obtained indicated that as long as the composition was such that it was to the left of a curve whose parameter was defined by the per cent carbon plus one-sixth of the silicon as equal to 2.0, no mottling occurred. To the right of the curve, mottling and eventually a gray structure occurred. Addition of 0.01 per cent bismuth resulted in a curve upward and to the right of the first curve, below which the mottling did not occur. It also was found that bismuth is not effective unless the metal temperature is 2700° or better.

At the Malleable Division roundtable luncheon, Victor Lindner, Feltman Research & Engineering Laboratories, Picatinny Arsenal, Dover, N. J., spoke on **Selection of Materials for Ordnance Development Programs.** He pointed out that such materials must meet definite military requirements, stand up to severe adverse conditions, and be used safely.

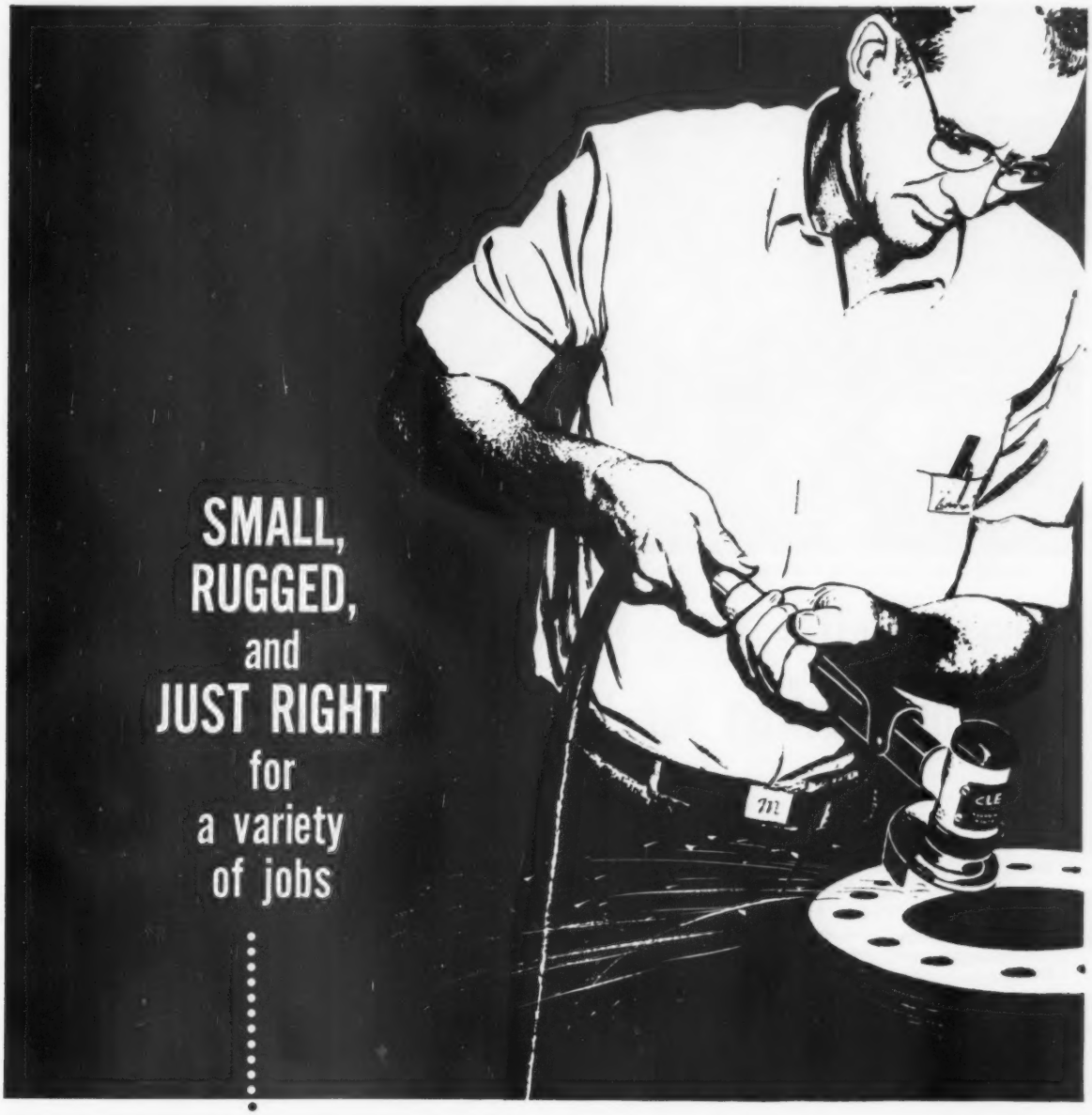
As some indication of the severe conditions, he mentioned temperatures ranging from minus 60 to 140° F and sometimes as high as 400° F. Mr. Lindner said that one of the aims is to obtain, if possible, a single material rather than a combination of several where possible.

He stated that heavy casualties in the Korean war caused by enemy mortar shells led to a study to improve the effectiveness of those used by the U. S. Through co-operation of the Albion Malleable Iron Co., the arsenal developed a pearlitic malleable iron, heat treated and oil quenched, for 81-mm mortar shells which meets military and other requirements mentioned earlier.

The luncheon closed with the presentation by the arsenal of a sound motion picture showing the field testing of the shells as well as the method of production of the shells at Albion Malleable Iron Co.

Specialized Foundry Statistical Controls to Improve Customers' Satisfaction by B. M. Appleman, Texas Foundries Inc., Lufkin, Tex. Development and installation of the company's quality control program reduced total hard and soft iron scrap from a 27-month average of 10.9 per cent to a full year of experience at 5.4 per cent, with still further gains anticipated. Savings amounted to about $80,000.

In setting up the program, analysis indicated that 15 per cent of the castings jobs caused two-thirds of the total quality loss. From this group five patterns were selected as representative and were studied for causes of hot cracking and shrinky tendencies. From that study it was recommended that metal be poured at below 2850° F, that the fines in the sand be limited to 5 per cent maximum, that the moisture be maintained at a point just sufficient for tempering, and that more than 4 to 5 per cent seacoal be used. While these steps resulted in improvement, further controls were developed to bring the losses



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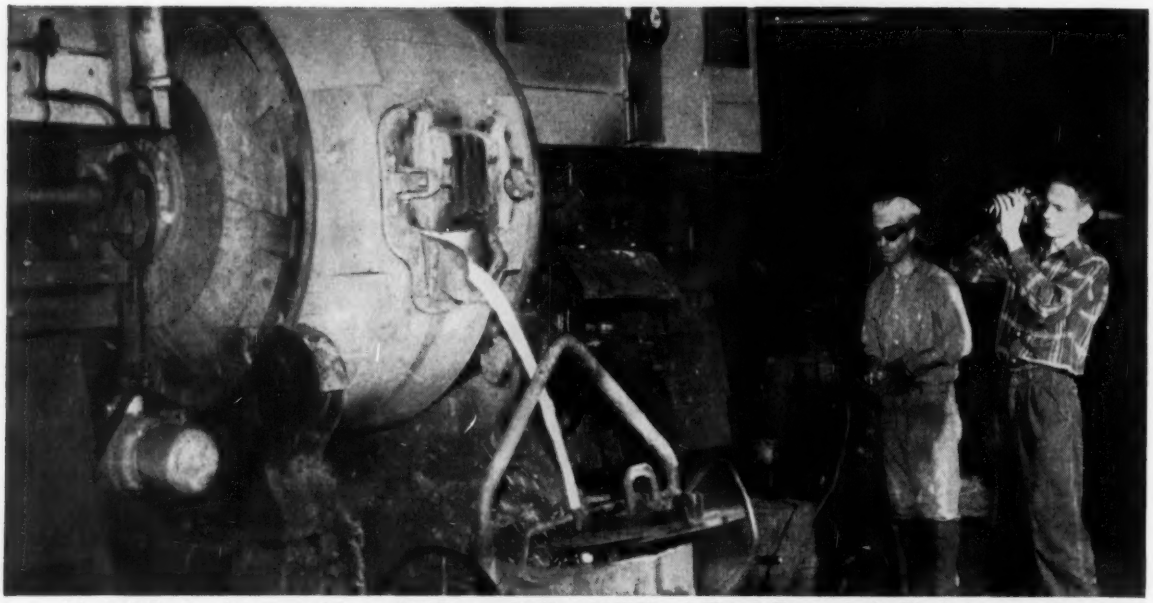

A heat of alloy iron being poured from a 1500-lb. capacity Type AAH Detroit Electric Furnace in the Westinghouse foundry.

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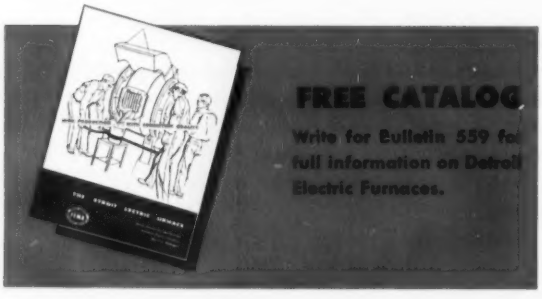

A Westinghouse man records a heat of ductile iron melted in Type AAP Detroit Furnace with motorized electrodes.

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down to the point mentioned earlier. The author described the methods followed.

Proper Gating Through Use of Cobalt 60 by A. J. Karam, Central Foundry Div., General Motors Corp., Saginaw, Mich. Application of that material to development of new casting design, to inspection, and to development of suitable gating systems was described. The author used slides to show how cobalt 60 was applied to overcome problems in a universal joint, a small crankshaft, a steering gear housing, and a connecting rod.

Application of cobalt 60 to castings examination resulted in internal soundness, reduced the time in getting the castings on the production line and in placing the castings in the customers' hands, and also broadened castings sales by increasing their scope.

Proper Interpretation and Techniques Using Magnaglo for Casting Inspection by A. R. Lindgren, Magnaflux Corp., Chicago. This type of inspection in small jobbing foundries is different from that used in production foundries. In the latter, the magnetic particle inspection begins on the pilot line where corrections can be made on the castings to avoid occurrence of certain defects.

Interpretation of data determined by this method of inspection should be agreed on by the customer and the foundry and should not be too strict. This inspection practice can give indications which are only superficial rather than actual defects, and it is important to distinguish between the two so that perfectly satisfactory castings will not be rejected.

Effect of Bonding Clays on Pin Holes in Malleable Castings by D. R. Jones, Illinois Clay Products Co., Chicago, and R. E. Grim, University of Illinois, Urbana, Ill. Presented by Mr. Jones. Gas evolution tests on western and southern bentonites, illite, and fireclay showed that the bentonites produced a sudden and appreciable evolution of water vapor at comparatively low temperatures, but the other two did not. This condition is believed to be due to the high content of adsorbed water in the bentonite.

Castings were made in sand bonded with the different clays, and it was found that pin holes occurred with the bentonites but not with the illite or fireclay. When the bentonite-bonded molds were torch dried prior to use, however, pin holes did not occur. Conclusion was that the sudden and abrupt evolution of gas from the bentonite was the cause of pin holes.

Porosity-Inclusion-Pin Holes in Malleable Castings by C. A. Sanders, American Colloid Co., Skokie, Ill. These terms first must be defined accurately since there is a degree of similarity in appearance. For example, pin holes can result from aspiration of air or gases in the gating system, evolution of gases from the metal or mold, and from reaction between mold and metal. Therefore, a careful examination of the interiors of the holes is advisable to determine the category or classification.

During his discussion, Mr. Sanders presented numerous slides to illustrate how to identify porosity, inclusions, and the different types of pin holes in malleable castings.

INDUSTRIAL ENGINEERING

● TWO sessions of the convention were devoted to Industrial Engineering and Costs. Four papers dealt with the industrial engineer, application of industrial engineering to small foundries, profits through cost control and time study and methods training.

The Industrial Engineer by M. E. Mundel, M. E. Mundel & Associates, Milwaukee. Today, industrial business executives must have production know-how. They must be able to make decisions. A manufacturing operation of any consequence needs a top manager to make decisions, middle managers to make decisions within company policy, and managers to carry out established plans. Depending on the size of the organization, some of these functions can be handled by separate individuals or doubled up.

Industrial engineering sometimes is another name for time study. As an organization grows, the industrial engineer moves closer to the executive level. If an aggressive industrial engineer becomes an executive, he is pretty sure to make use of an aggressive staff.

Practical Industrial Engineering for the Smaller Foundry by F. E. Noggle, Westover Corp., Milwaukee. For this paper, the definition of a small foundry was one having 50 to 100 employees. The goal of industrial engineering is the lowering of costs. First it is necesssary to obtain the facts on costs, then set up a suitable cost control system and train personnel to maintain the system. One of the big needs for the small foundry is to improve its estimating practice, and a cost control system will facilitate this improvement.

Profit Management through Cost Control by Robert Hill, Dominion Bridge Co., Montreal, Que. Profits don't happen—they have to be produced. It is necessary to develop a plan to realize a profit, and this plan actually is a control of manufacturing costs. Cost control is a regular part of management's job. When a program is established, it is the job of top management to see that all levels of company management are sold on the advantages of the program.

Cost control covers three main elements—direct labor, direct material, and overhead. For direct labor, it is necessary to determine how much time should be spent doing each job. This helps the sales department to determine the price at which castings should be sold. Best practice is to base direct labor on an incentive system.

Direct material cost is fairly well established by market prices. For the foundry, the chief material item is metal and only to a degree can management do much about it. For example, a given composition usually can be obtained by combining various proportions of virgin metal, alloys, and scrap. The last frequently

fluctuates in price, and the alert foundryman can minimize his metal costs by varying mixtures to use the most scrap when its price is lowest.

Overhead, too, remains fairly well established and can be altered only on a long-term basis. Furthermore, overhead represents a high percentage of total costs.

In the foundry, the most common standard, and a good one, is cost of castings in cents per pound or dollars per ton. Knowing its costs, management can make a cost budget based on anticipated volume. Profits can and should be planned for.

Time Study and Methods Training for Supervisors by John Taylor, Norris & Elliott Inc., Columbus, Ohio. A wage incentive plan is based on the "unit," and the unit represents a definite amount of work which should be performed in one actual minute.

Training in time study and methods for supervisors, or union stewards, can be given in a course of six sessions of 60 to 90 minutes each conducted once a week. Time study makes allowances for a worker's personal hygiene and rest while measuring his productivity. Once basic time studies are made, they can be used to build standard data to eliminate the necessity for making a new study for each new job.

In training courses, the supervisors or union stewards learn how to set standards just like industrial engineers do. This practice is not to train them to do this kind of work regularly but to understand how it is done and the purpose for doing it, and to inculcate an interest in it.

"You were right, Bascom. You did forget to cut the gate"

Supervisors and stewards are handled in separate classes, it being considered inadvisable to combine the two groups.

Time studies have not been applied to foundry industry operations to the same degree as in other industries, which is unfortunate considering the usefulness they can serve. In essence, the purpose of making time studies is to find how to do something better at less effort.

The idea in time study and methods training of supervisors and union stewards is to stimulate their interest in methods improvement. It is important for supervisors to understand how standards are set, and to be able to answer questions of rank and file workers. If the supervisors understand how standards are set, they are interested. If they don't understand, they are not likely to be interested and may be skeptical.

BRASS and BRONZE

● THIRTEEN papers relating principally to operating practices, alloy properties, and casting applications were included in the comprehensive program presented by the Brass and Bronze Division at three technical sessions and a roundtable luncheon meeting.

Electrical Conductivity of Sand Cast Copper-Base Alloys by D. G. Schmidt and F. L. Riddell, H. Kramer & Co., Chicago. Presented by Mr. Riddell. This paper represents the results of a program conducted to determine the electrical conductivity of the many commercial copper-base foundry alloys. The tests were conducted with the standard 0.505-in.-diam test bar.

Tests covered the standard ASTM copper-base alloys, tin bronzes and leaded tin bronzes, high-lead tin bronzes, leaded red brass and leaded semired brass, yellow brass, sand cast aluminum bronzes, nickel silvers, silicon bronzes and brasses, manganese bronze, aluminum bronzes, and copper-silicon alloys.

The studies also determined the effect on electrical conductivity of various alloying materials. Conductivity declines with an increase in tin and nickel. Aluminum has relatively little effect. In the copper-silicon alloys, an increase in silicon decreases electrical conductivity. Within the range of silicons used for copper-silicon alloys, an increase of approximately 10 per cent in zinc does not appreciably lower the electrical conductivity of these alloys.

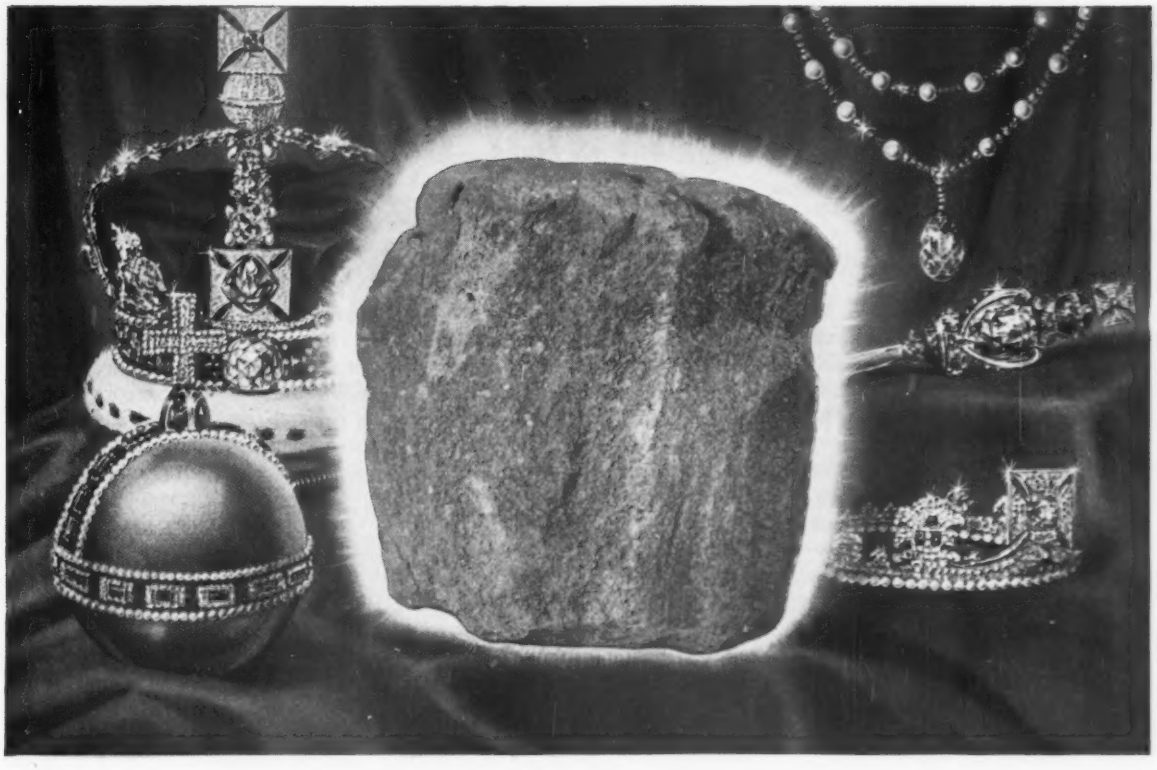
Some Foundry Problems in the Development of a New Marine Propeller Alloy by A. J. Smith, Bethlehem Steel Co., Shipbuilding Div., Staten Island, N. Y. Increased service requirements of higher horsepower ships established the need for a new propeller alloy. Material selected was a nickel-aluminum bronze. It was believed to have the best combination of wear resistance, mechanical properties, and foundry handling qualities. Certain problems developed, however, in establishing the best casting practice.

The alloy contains 4.5 to 5.5 per cent nickel, 9.0 to 10.3 per cent aluminum, 3.5 to 5.5 per cent iron, and 78 to 81 per cent copper.

Close control of the combustion atmosphere was required to prevent excessive gas absorption and oxidation. Gas was absorbed by metal melted in all types of melting equipment tested but was pronounced in reverberatory furnaces. Gas pickup was reduced to a comparatively harmless level by gas flushing.

Conventional molding methods and materials were employed. The most difficult problem in the production of this alloy was feeding the propeller casting. The high temperature involved—2080 to 2130° F—prevented use of plaster insulating riser sleeves.

Water-cooled chills were used successfully to promote directional solidification in large propellers and materially reduced the time required for complete solidification. For



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nickel-aluminum bronze of low gas content, pouring temperature was found to have no appreciable influence on mechanical properties.

Advantages of the nickel-aluminum bronze alloys for propeller use include higher physical properties compared with manganese bronze, relatively light weight, low notch sensitivity, and reduced maintenance.

Metallurgical and Foundry Aspects of Quality Control—This subject was covered by three talks. They related to various types of testing of brass and bronze castings.

Fracture Testing in a Production Foundry by W. Ward, American Radiator & Standard Sanitary Corp., Cincinnati. Fracture testing offers a valuable tool in determining proper pouring temperature. By pouring at various temperatures and fracturing the casting, indications are given of the correct temperature at which the casting should be poured. Once this temperature has been established, additional fracturing during the day provides a check on quality.

Castings should be inspected promptly after fracturing, since variations can occur if the castings are allowed to stand for a long period.

The fracture test can indicate if defects are shrinkage, porosity, or if the difficulty is caused by faulty melting, poor sand control, or improper gating.

Nondestructive Testing by Saul Goldspiel, New York Naval Shipyard, Brooklyn, N. Y. Radiography is a valuable inspection tool but must be understood and applied properly. It is particularly useful in pilot work. With proper application it can result in the production of better and cheaper castings.

Instances were described of the use of radiography in arriving at correct foundry practice for various types of castings. Use of radioactive materials, such as cobalt and iridium, is especially helpful in inspecting certain types of hollow castings where the source of energy can be inserted inside the castings.

The Bureau of Ships has established a standard for radiographic inspection of brass and bronze castings up to 2 in. thick. Additional standards for other thicknesses are to be prepared later.

Mechanical Aspects of Testing by A. J. Smith, Bethlehem Steel Co., Shipbuilding Div., Staten Island, N. Y. Physical tests include tensile strength determination, hardness testing, and fatigue testing. Location of the test specimens on the castings should be a subject for discussion between the designer and the foundry.

Wide variations in physical properties can be found in the test specimen, depending on their location. The test specimen actually tells only the quality of the metal. Test bars attached to the casting often have dross inclusions and give misleading results as to physical properties.

Effects of Foundry Variables on Porosity of 85-5-5-5 Bronze by R. A. Flinn and C. R. Mielke, University of Michigan. Presented by Dr. Flinn. This progress report covered a research project which is seeking to determine what combination of chilling and risering is needed to produce sound castings. Recent work has dealt with the measuring of thermal gradients in sound and unsound bars.

It was determined that a gradient of 60°F per inch is the critical figure required to produce soundness in 2-in.-thick sections. It is planned to make similar studies of other bar and plate sizes. Once the required gradient is known, it is possible to apply this information to castings by dividing the castings into simple shapes. In this manner, chill and riser requirements can be ascertained.

Getting Castings Back into the Foundry by R. R. Ashley, American Radiator & Standard Sanitary Corp., Cincinnati. Use of the carbon dioxide process has made it possible to recover business lost to other forms of fabrication, including screw machine work. This company uses three machines for blowing and gassing molds in a stack molding operation. A washer is used to reclaim the sand. Reclaimed sand comprises 75 per cent of the mix.

Improved accuracy of castings produced has resulted in a decrease from 15 per cent to 9 per cent in the amount of metal that must be removed in machining. A metal yield of 65 per cent is obtained with CO_2 castings, compared with 50 per cent in castings produced in green sand. Substantial cost savings in total have been achieved. In one case a casting which cost $35.29 per thousand pieces now is produced in CO_2 molds at a cost of $8.22.

Research and Development in Bronze Sleeve Bearings by G. E. Langford, Superior Kendrick Bearings Inc., Detroit. Producers of

CONGRESS SPEAKER: Dr. Albert deSy (center), University of Ghent, Belgium, presented two papers at the AFS Congress. He is shown here with James Delbeke (right), Union Miniere du Haut-Katanga, Brussels, Belgium, and Merrill M. Foote, American Steel Foundries. The steel casting, a 222-pound fifth wheel for a highway tractor-trailer coupler, was cast in a shell mold by American Steel

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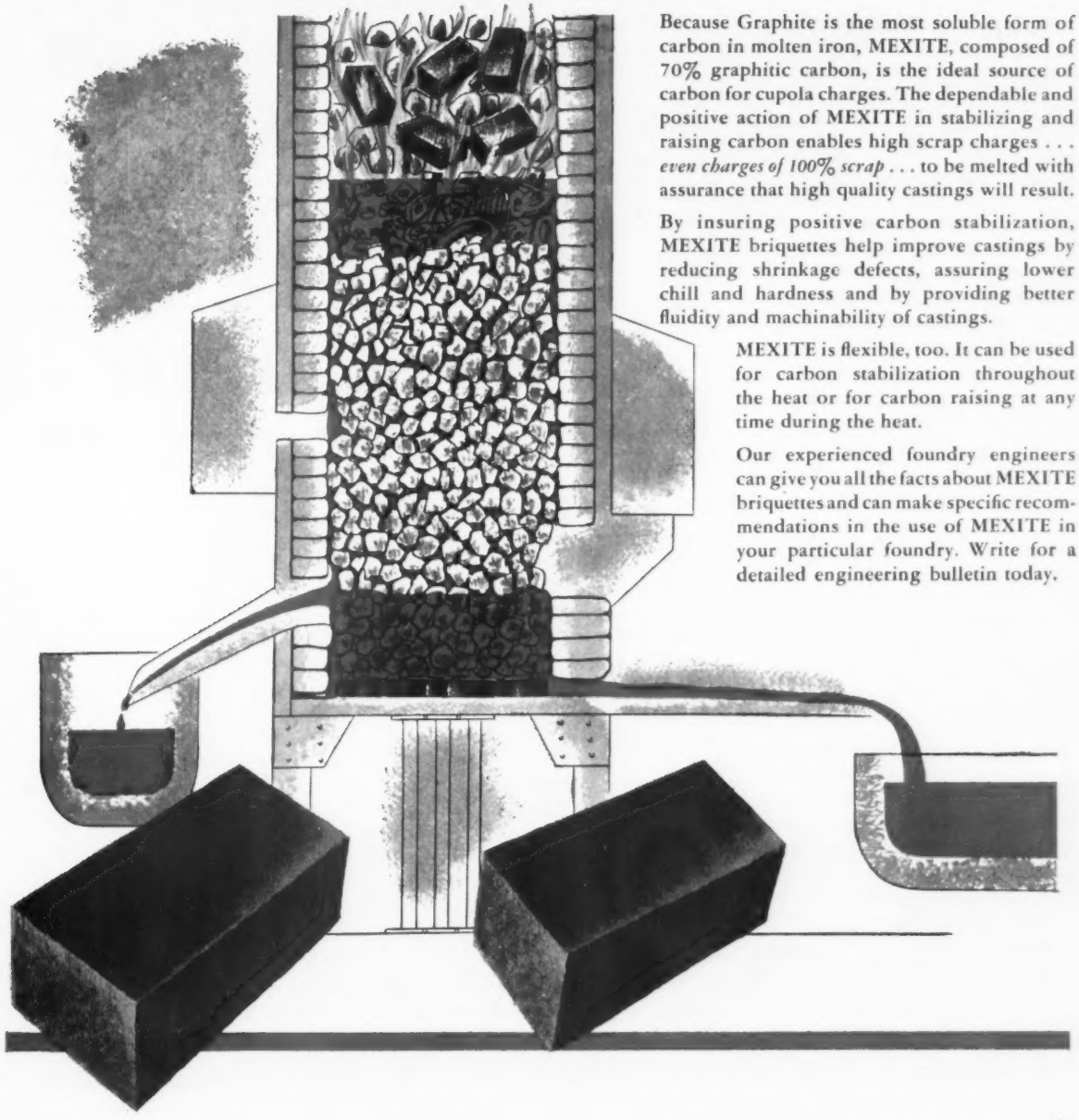

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bronze bearings and bushings lost business because of the lack of design data available to the engineer. As a remedy, a number of producers organized the Cast Bronze Bearing Institute, which now is a product group of the Non-Ferrous Founders' Society.

Its most important activity has been the development of a technical manual for design engineers. This manual has been completed and is being distributed. It incorporates comprehensive data which will aid the design engineer in specifying cast products.

Properties and Composition of Cast Copper-Nickel Alloys by Saul Goldspiel, New York Naval Shipyard, Brooklyn, N. Y. Study was made of the optimum percentages of iron, manganese, and silicon to obtain the best physical properties in 90-10 and 70-30 copper-nickel alloys.

In analyzing the welding properties of these materials, it was found necessary to revise percentages of iron, manganese, and silicon from the figures which provided the best physical properties.

Research on 90-10 Cupro-Nickel Castings by E. F. Tibbetts, Wollaston Brass & Aluminum Foundry Inc., North Quincy, Mass. Study was made of alloys best suited for heavy sections of pumps, fittings, and valves. From the standpoints of strength, corrosion resistance, pressure tightness, machinability, weldability, and price, the copper-nickel alloys were found most suitable.

Some questions remain to be answered in using this material where welding is required, the correct percentage of silicon content being one case in point. Examples of various applications of 70-30 and 90-10 alloys for pump and valve parts were described.

Brass and Bronze Roundtable Luncheon—Three papers related to the general subject of "Why Use Brass and Bronze Castings?" were presented at the division's roundtable luncheon.

Physical and Mechanical Properties of Cast Bronze Alloys by John Kura, Battelle Memorial Institute, Columbus, Ohio. Ignorance of properties of brass and bronze is the main reason why engineers do not specify these castings more often. Materials are being considered more critically today than in the past, and unless comprehensive data are available on them, including performance at varying temperatures, they are likely to be neglected.

Mr. Kura described the long-range program of the Brass and Bronze Institute at Battelle, which is studying 16 mechanical and physical properties of three copper-base alloys, in addition to the accumulation of stress rupture and creep data. Alloys investigated are 85-5-5-5, 80-10-10, and manganese bronze.

Automotive Use of Copper-Base Alloy Castings by H. C. Tyree, Electromotive Div., General Motors Corp., LaGrange, Ill. Automotive use of brass and bronze castings has declined in recent years, in contrast to the sharp increase in use of aluminum. This situation is ascribed to the high and fluctuating costs of copper, the slow development of cost-saving methods by copper-base alloy casting producers, the competition from other materials, and the lack of aggressive selling on the part of foundries.

Cast Copper-Base Alloys for Corrosive Environments by C. L. Bulow, Bridgeport Brass Co., Bridgeport, Conn. Experience gained in both laboratory and field tests is an important factor in the selection of materials. In the case of copper-base products, wide applications exist where liquids are present and corrosion resistance is an important consideration. The wide range of these applications was illustrated by the numerous products where brass and bronze materials now are being used.

SAFETY and HYGIENE

● A SINGLE session sponsored by the Safety, Hygiene, and Air Pollution Control Committee consisted of two papers, one dealing with the use of radiographic inspection equipment and the other with audiometric testing for noise control in foundries.

Practical Planning for Nondestructive Testing by Use of Radiation by F. S. Sutherland, Continental Foundry & Machine Div., Blaw-Knox Co., East Chicago, Ind. Considerations in the choice of equipment for radiographic testing, exposure room design, protective materials and procedures to be employed, and employee considerations were discussed.

In his remarks, the author covered applications of 250, 1000, and 2000 kv x-ray machines and the betatron. He also described equipment and testing procedures used in his foundry.

Audiometric Testing Programs in Foundry Noise Control, by H. T. Walworth, Lumbermen's Mutual Casualty Co., Chicago. For over 100 years it has been known that a relationship exists between noise and loss of hearing. The problem of hearing loss has become more acute over the years with the mechanization of industry because exposure to noise has been increased. The employee compensation claims for partial loss of hearing have been increasing even if no loss of wages is involved.

Loss of hearing occurs at the critical noise level of 90 or more decibels. In foundries, nearly 90 per cent of exposure is above this magnitude.

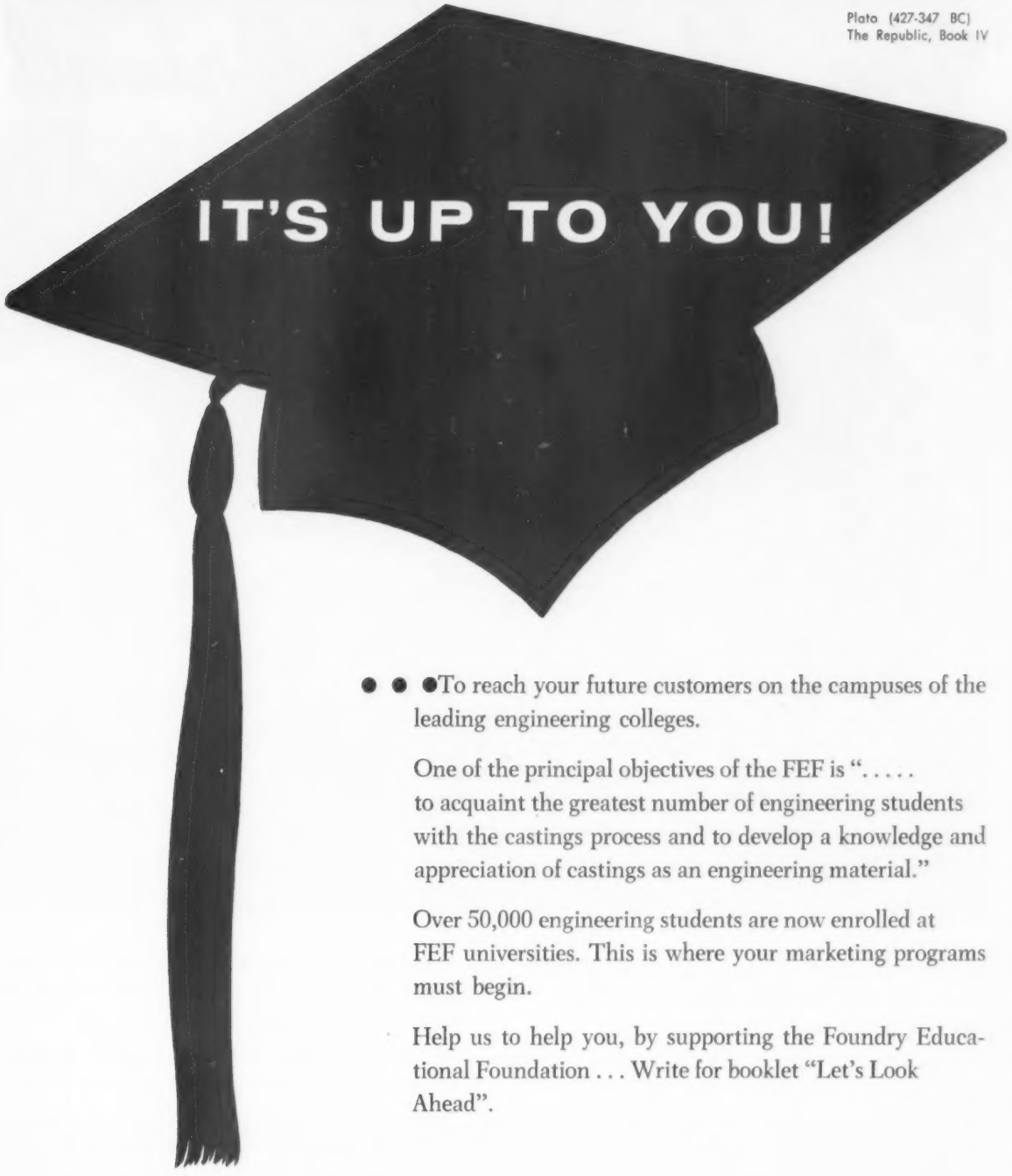
The principles of audiometric testing for loss of hearing were discussed and a test program for foundries suggested. This program should include testing a person's hearing before he is employed, conducting periodic examinations, keeping accurate records of the hearing ability of employees, and checking the effectiveness of noise control programs.

State laws concerning loss of hearing will become more common, and compensation claims will become more frequent. As they do, testing will become increasingly important.

(To be concluded next month)

"The direction in which education starts a man will determine his future life."

Plato (427-347 BC)
The Republic, Book IV



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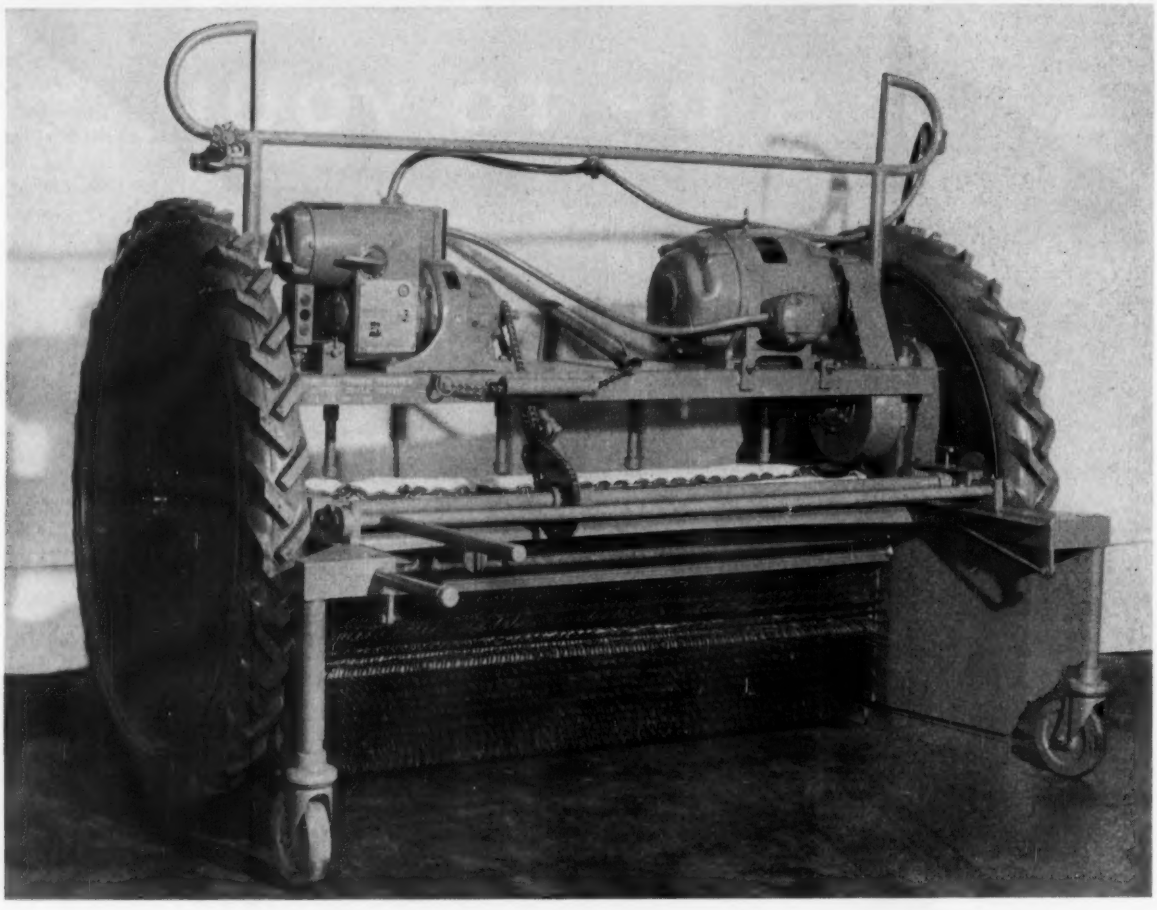

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Circle 671 on Page 53

Past chairmen of Texas Chapter, left to right, are C. R. McGrail, Jake Dee, E. P. Trout, F. M. Wittlinger, J. M. Bird, E. C. Brown, J. R. Hewitt, F. W. Wey, M. W. Williams, W. A. Bearden, P. B. Croom

Broad Program Presented at

TEXAS REGIONAL CONFERENCE

C. R. McGrail, general chairman of the Texas Conference

By WILLIAM G. GUDE
Managing Editor

● AN extensive and attractive technical program helped to draw a record number of Texas foundrymen to the Menger Hotel, San Antonio, on March 19-20 for the Texas Regional Conference of the Texas Chapter, American Foundrymen's Society.

The first regional conference to be held in San Antonio since 1950, the two-day meeting had a registration of 225, not including some 50 ladies who participated in a program of their own.

Charles R. McGrail, Alamo Iron Works, San Antonio, was general chairman of the conference committee, which also included Harold H. Judson, University of Houston, James R. Hewitt, Quality Electric Steel Castings Inc., Houston, and Elmore C. Brown, Whiting Corp., Houston.

Technical discussions covered 18 papers. A luncheon session the first day had Lewis H. Durdin, national AFS president, as speaker. A Texas barbecue and entertainment that evening and a concluding banquet Friday evening completed the program.

A high light of the banquet, presided over by Texas Chapter chair-

Among speakers at the San Antonio conference were Anton Dorfmueller Jr., Charles F. Lewis, Herbert von Wolff, John Bridges, and P. B. Croom

Speakers L. J. Venne, O. J. Myers, Ralph A. Clark, and Day E. Cutler

man Harold H. Judson, was the presentation of handsome cast plaques to past chairmen of the chapter. Initial presentation was to F. M. Wittlinger, Texas Electric Steel Casting Co., Houston, who spearheaded the formation of the chapter in 1943 and who served as its first chairman.

Other past chairmen include Ed P. Trout, Lufkin Foundry & Machine Co.; W. M. Ferguson, Texas Electric Steel Casting Co.; Marvin W. Williams, Houston Foundry & Machine Co., Houston; Jake Dee, Dee Brass Foundry Inc., Houston; Charles R. McGrail; W. H. Lyne III, Hughes Tool Co., Houston; John M. Bird, American Brass Foundry, Ft. Worth; P. B. Croom, Houston Pattern Works; Israel Smith, Western Foundry Co., Tyler; Edward W. Wey, Dee Brass Foundry Inc.; James R. Hewitt, Quality Electric Steel Castings Inc.; W. A. Bearden, M. A. Bell Co., and E. C. Brown, Whiting Corp.

Principal banquet speaker was Dr. Harold Vagtborg, Southwest Research Institute, San Antonio, who discussed the importance of water supply to industry of the Southwest and possible means of overcoming shortages.

Opening technical session was a general meeting on the subject of coremaking. It got under way following a welcoming address by Mayor J. Edwin Kuykendall of San Antonio.

Which Core Process?—Foundries have a wide choice of methods for producing cores. Since no one type of binder is best adapted to all applications, it is necessary to experiment to determine the one offering the desired combination of economy and efficiency.

Anton Dorfmueller Jr., Archer-Daniels-Midland Co., Cleveland, analyzed the properties, cost, equipment requirements, and principal applications of leading binders. These binders included core oils, resins, sodium silicate, and the air setting types.

Shell Cores—Numerous illustrations of intricate cores being made in shell form were presented by Herbert von Wolff, Shalco Corp., Palo Alto, Calif. Despite certain disadvantages, some aluminum foundries have turned to use of the more economical urea resin for shell cores. Better collapsibility compared with phenol resin is reported.

Problems connected with production of low-carbon steel castings in shell have been licked, according to Mr. von Wolff. Use of ½ to 1 per cent of a newly developed additive with the sand is said to prevent burn-in, improve casting surface finish, and increase sand flowability.

Aluminum Quality Control—Causes of and cures for nonmetallic inclusions and porosity in aluminum castings were discussed by D. L. LaVelle, American Smelting & Refining Co., South Plainfield, N. J.

Dross and oxide result from mixing molten metal with air. Flux inclusions occur if sufficient time is not allowed for powdered flux to separate from the metal. Porosity caused by trapped air usually results from careless pouring. Gas porosity can be minimized by careful melting and adequate degassing. Shrinkage porosity results from improper or inadequate gating, risering, and chilling practices.

Aluminum Melting and Pouring—Detailed review of types of melting furnaces, degassing techniques, grain refining practice, and applications of different alloys was given by T. E. Kramer, American Alloys Corp., Kansas City, Mo. Marked improvement in aluminum casting quality can result from attention to sprue design. Examples were shown of castings poured with sprues of two different diameters. In all cases the smaller sprue reduced turbulence and resulted in a casting of noticeably superior soundness.

Common Sense in the Foundry—Application of established practices can result in production of good quality brass and bronze castings. Nevertheless, foundries should constantly be looking for ways to improve their operations, said Edward Mooney, Benj. Harris Co., Chicago Heights, Ill.

Carelessness in melting and handling metal is the main cause of scrap. Cleanliness is essential for both the metal and melting medium. Melt quickly and don't superheat excessively. Let the metal stand after melting and break the surface regularly to permit gas to escape. Use the thermocouple correctly, and experiment to arrive at the best pouring temperature.

Top—David Matter, V. H. Patterson. Bottom—Gordon Gottschalk, Dale Davis, and Tom E. Barlow

Brass and Bronze Quality Control—Melt quality, gating, feeding, and metal temperature are factors to watch in seeking production of high-quality castings, it was emphasized by Ray Cochran, R. Lavin & Sons Inc., Chicago.

The most important single feature of a gating system for brass or bronze is a choke. The gating system should do these things: 1. Permit the mold to fill rapidly without undue turbulence. 2. Prevent aspiration of air or gas. 3. Minimize mold and core erosion. 4. Trap dross and slag. 5. Promote directional freezing. 6. Provide

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Copper Castings—The A. W. Cadman Mfg. Co. produces copper castings ranging in size from 50 to 3500 lbs., usually with either a seamless steel or monel cooling coil cast integrally. In using the CO_2 process, of the many binders available, Alex M. Cadman, Jr. uses Paraset for producing all cores and molds. Reason: "We have to be sure that our molding is perfect, in order that we do not scrap a very expensive monel cooling coil."

Other Metals—Equally advantageous in gray iron, aluminum, brass and bronze foundries, Paraset has received these user reports: "increased production," "better collapsibility" and "finer finish."

For Economy and Custom Collapsibility . . . Specify Paraset

PARASET TRIAL SAMPLE

5 Gallons at Low Drum Price

Specify Metal(s) to be cast

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NEW! CO_2 SHELL COAT

Liquid Resin for Use on CO_2 Cores

Provides surface strength and seals surfaces from moisture gain or loss caused by summer heat and humidity. As The Cadman Company states for CO_2 cores: "Shell Coat is, by far, the best coating we have found." SAMPLE ON REQUEST.

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Circle 672 on Page 53

maximum yield and minimum cleaning consistent with high quality.

Dry Air vs. Oxygen for Carbon Reduction—Use of dry air in combination with oxygen for oxidizing purposes has a definite place in steelmaking, it was stated by John B. Bridges, Cameron Iron Works, Houston, Tex. Results of a number of tests with air alone and air-oxygen combinations were described. These tests included air use for stirring as well as blowing for carbon removal.

Carbon removal with air naturally is slower than with oxygen. No large pickup of nitrogen from the air occurs, and the blow causes some temperature drop. These recommendations were offered: 1. Use a dryer in the air line to keep out excess moisture. 2. Blow the heat at as high a starting temperature as feasible with furnace operations. 3. Try to combine oxygen with the air so that the neutral nitrogen helps keep the bath temperature down and carbon is removed at an economical rate.

F. M. Wittlinger, left, first Texas Chapter chairman, being presented plaque by Harold H. Judson, the current chairman

Heat Treatment of Steel Castings—A plea for a better understanding of the fundamentals of metallurgical reactions in steels, as affected by temperature and cooling rate, was expressed by Charles F. Lewis, Cook Heat Treating Co. of Texas. A large majority of the foundryman's operating problems can be explained if he becomes thoroughly familiar with the theories expressed by the iron-carbon diagram and time - temperature-transformation curves. Examples were cited to support this thesis.

Melting Steel for Castings—Trends toward the substitution of electric furnaces for the open-hearth type, and the replacement of acid-lined units with basic-lined furnaces, have prevailed in recent years, it was pointed out by L. J. Venne, Union Carbide Metals Co., Cleveland.

Preference for basic practice results principally from inability of the acid furnace to remove sulfur and phosphorus from the melt. At the same time relatively few foundries have adopted the double slag process for removing these elements. Nevertheless, many foundries are producing excellent castings with acid electric practice.

Considerable attention is being devoted to the general subject of deoxidation and resulting inclusions. Interest also has developed in improving cast steel properties through minor modifications of chemistry.

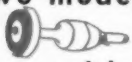
Cupola Design and Operation—Various trends are apparent in cupola design and operation, according to Ralph A. Clark, Union Carbide Metals Co., Cleveland. They include more instrumentation, better blast distribution, improved cokes, and greater use of hot blast and mixing ladles.

There is a need for more precise makeup of charges; even the best mechanical chargers do not deposit material exactly as desired.

Poor quality and high price of coke in Europe stimulated development of improved recuperative blast preheaters. While neither water cooling nor hot blast is new, cupolas of this type have many advantages for the production of ductile iron. Use of the unlined, water-cooled cupola illustrates a growing realization of the interchangeability of many charging materials, with over-all economics dictating the choice.

Other new developments cited included operation of the unlined hot-blast cupola under acid conditions; carbon injection using nitrogen as a carrier; wider sources of silicon and chromium; and a new plunging device for magnesium addition in ductile iron production.

Cupola Refractories—Important effect of slag viscosity on cupola refractory life was emphasized by Thomas E. Barlow, Eastern Clay

AIRETOOL pneumatic grinders cut metal removal costs. They have plenty of reserve power to tackle tough jobs, save time. Lightweight, perfectly balanced, they maneuver easily — no operator fatigue. AIRETOOL makes two models of horizontal pneumatic grinders  **6" and 8" wheels, for 6000 and 4500 rpm; two models of heavy-duty vertical grinders for** **6" abrasive wheel and 7, 8 or 9" disc wheel. Write for Catalog 67.**

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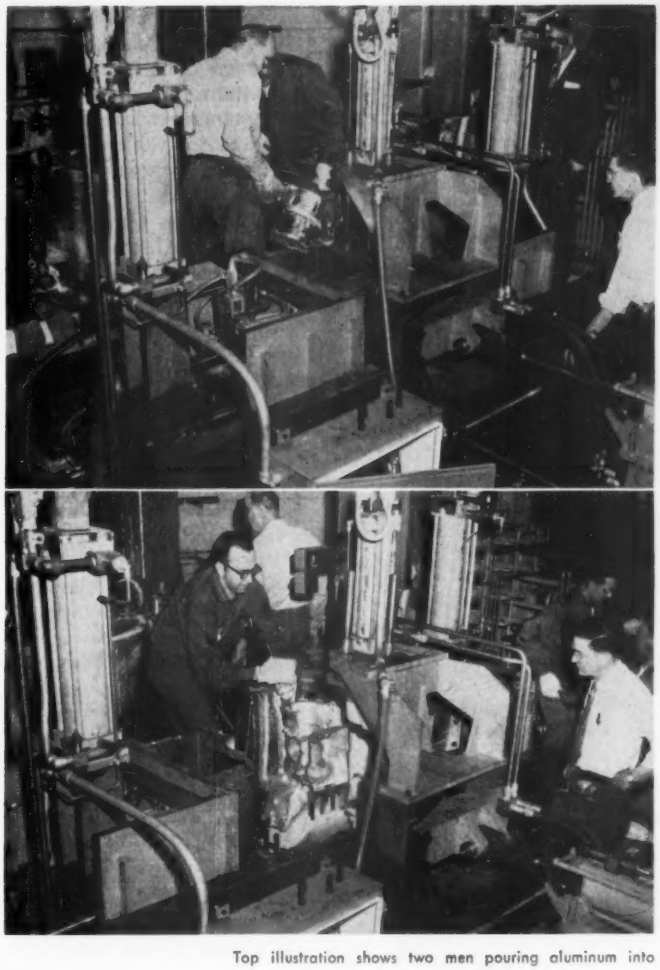

Top illustration shows two men pouring aluminum into a permanent mold of a transmission case. Bottom picture shows the finished casting being ejected after the molds have opened

SELF CONTAINED AUTOMATICALLY CYCLED PERMANENT MOLD MACHINE PRODUCES 23 LB ALUMINUM CASTINGS

Because of the ever increasing size of aluminum castings used in the automotive industry, the PERMANENT MOLD DIE CO. devoted a lot of time and effort toward the development of automatically cycled permanent mold machines for the production of large automotive aluminum castings. The one pictured here is of minimum weight. Machine can accommodate larger castings. This automatically cycled machine is the perfect answer to all those questions. Check these points: —Fully automatically cycled and self lubricated — Variable timing — Non-flammable hydraulic system, water cooled — Automatic casting ejection. These machines have been developed and proved only recently, but the profits they have made for users are already in the records. If you are interested in the economical production of large aluminum castings on a given number per day basis, you might want to ask us about our machines.

The Permanent Mold Die Company has long earned the respect and confidence of automotive manufacturers. For years they have specialized in the production of permanent molds and cores, and die cast dies. Qualified engineering and foundry personnel can tackle and solve any permanent mold problem you care to throw at them. Best of all, company prices are well within reason. Delivery, of course, is always on time.

PERMANENT MOLD DIE COMPANY, INC.

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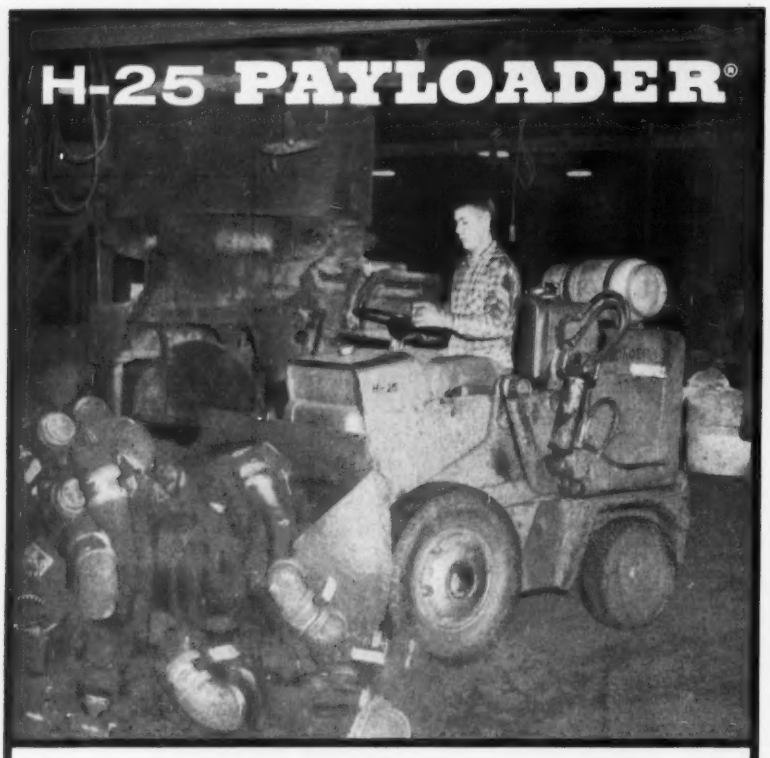

"moves 25-30% more material"

Bremen Gray Iron Foundry, Inc., Bremen, Ind., has been using "PAYLOADER" tractor-shovels for 9 years and has developed an efficient "PAYLOADER" sand-handling set-up.

According to General Manager, H. J. Hueni, their Model H-25 with 1,500 hours of service is an 11 to 16-hour work horse each night. It moves the castings and sand (about 250 tons) from the floor to the shake-out about 200 feet distant. On return trips, it delivers sand (about 210 tons) from muller to the 35 molding stations.

Night Foreman, Gene Hawkins says, "No getting around it, our 'PAYLOADER' units do lots of work and require few repairs. The Model H-25 has greatly improved material-moving efficiency. Its larger capacity, combined with power-shift transmission and power-steer, are the main reasons it moves 25 to 30% more tonnage an hour than our Model HA's."

More power—more traction
Backing up the increased carry capacity (2,500 lbs.) and faster cycles of the Model H-25 are greater engine power, power-transfer differential and 4,500 lbs. of bucket breakout force that provide more reliable traction and digging power . . . all accomplished while reducing the turning radius to 6 feet.

If you want the most carry capacity on the shortest-turning tractor-shovel for sustained high output, ask your Hough Distributor to demonstrate a Model H-25.

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5-A-2

Name
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Company
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City State

Products Dept., International Minerals & Chemical Corp., Skokie, Ill., in a discussion of factors affecting monolithic linings.

Rate of refractory loss is determined by the rate at which slag reacts with the refractory. Presence of a glaze on the lining minimizes the latter's erosion, provided the glaze is sufficiently high in viscosity. This fused glass on the surface of the lining gives it a somewhat plastic nature and helps to prevent erosion as long as there is not too much glass and its fluidity is not too great. Both extremely fluid and extremely erosive slags must be avoided.

Gray Iron Metallurgy—A comprehensive review of the metallurgy of gray iron was presented by Vernon H. Patterson, Vanadium Corp. of America, Chicago. Metallurgy of the solidification of metals in general was described and related to the mechanism of gray iron solidification. Graphite flake precipitation during solidification, during the cooling of austenite in the solid state, and during the eutectoid transformation was discussed. Effect of inoculation of gray cast iron and influence of pouring temperature and alloying elements were other points covered.

Pattern Engineering—Many factors must be considered before deciding on the type of pattern to be made for a particular job, it was pointed out by P. B. Croom, Houston Pattern Works, Houston. These include such items as number of castings to be made, probability of design changes, tolerances required, machining problems, type of molding equipment, etc.

Too often there is an almost complete lack of specifications for determining the quality of the pattern for which an inquiry is issued. Because it is impossible to write a specification that will cover all types and sizes of wood patterns, it is necessary that specifications be written for each job. The more complete these specifications are, the more nearly the patternmaker will be able to supply the quality the buyer wants.

Self-Curing Binders — Advantages, disadvantages, and use of self-curing binders were discussed by O. J. Myers, Reichhold Chemicals Inc., White Plains, N. Y.

Speaking of future developments,

he said that applied research is being directed toward the manufacture of an organic binder which will have nearly infinite bench life and still be able to be cured without oven heat. Sodium silicate, an inorganic binder which does not burn out, inhibits collapsibility, makes "burn-on" more of a problem, and develops more gas from the moisture remaining in the core after hardening than would be the case if organic films were the only binding media.

Carbon Mold Materials—Use of carbon sand and carbon flour as an additive to silica-base sands, and also as an all-carbon base mix, was explained by Day E. Cutler, J. S. McCormick Co., Pittsburgh.

Carbon offers resistance to metal penetration through its stability under high heat, low rate of expansion, and non-wetting characteristics. Photos of castings made with various combinations of carbon material, plus a movie of molding, pouring, and cleaning of large iron rolls made with carbon sand, were shown.

Refractory Coatings—A review of the various types of mold and core coatings available, together with their properties and applications, was presented by Gordon Gottschalk, Thiem Products Inc., Milwaukee. Principal types discussed were silica, mullite, olivine, magnesite, graphite, and zircon base coatings.

Shell Molding—Fundamentals of the shell molding process were detailed by Dale Davis, Oklahoma Steel Castings Co., Tulsa, Okla. In designing a pattern or corebox, like materials with the same coefficient of expansion should be used. Separate cope and drag patterns should be as uniform in mass as possible to keep expansion under heat constant. Risers are highly important in shell molding and should be used liberally.

The principal defect in shell molded steel castings is a surface roughness known as pitting. Suggested explanation for its occurrence is that decomposition of the resin develops gas and heat. The heat is sufficient to cause partial remelting at the surface, and the gas pressure forces depressions into this liquid-solid zone and causes the pitting effect.

Gating and Risering—Correct de-

WHEELABRATOR® STEEL SHOT SLASHES ABRASIVE COSTS 35%

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sign of a casting is essential if most effective use is to be made of a gating and risering system, it was pointed out by David Matter, Ohio Ferro-Alloys Corp., Canton, Ohio. Carbon equivalent of the iron, expected shrinkage, and metal fluidity all affect gating design. Runner arrangement should be such as to influence direction solidification as desired and provide nonturbulent flow through the ingates.

Fourth Foundry Instructors Seminar Planned by AFS

Fourth annual Foundry Instructors Seminar of the Education Division, the American Foundrymen's Society, will be held at the University of Illinois, Urbana, Ill., June 18-20.

An increasing number of teachers and supervisors of foundry and patternmaking subjects in secondary schools avail themselves of these programs to keep abreast of new techniques, materials and methods in the castings field, for use in development and improvement of their own school courses.

Teaching aids, curricula, shop layout, laboratory equipment, new casting methods and molding techniques will feature the program. According to Ralph E. Betterley, education director of the AFS, the seminar will include one full day of demonstration and laboratory activities.

Magnesium Association Holds Spring Technical Sessions

Spring technical meetings of the Magnesium Association were held in Chicago, April 16-17. Program of the Casting Division occupied the first morning, that of the Fabricating Division the second morning, while both divisions participated in the first afternoon's program.

Casting subjects discussed included "Metal Efficiency in the Magnesium Foundry" by F. C. Bennett, Dow Chemical Co.; "Die Casting Standards" by R. C. Cornell, Litemetal Diecast Inc.; "Economics of Using Magnesium Bottom Boards" by T. H. Hargitt, Light Metals Inc.

A panel discussion of new magnesium alloys had George Sandenburgh, Hills-McCanna Co., T. McGill, Southgate Aluminum & Magnesium Co., and K. E. Nelson, Dow Chemical Co., as participants.

Another panel, discussing use of direct-reading spectroscopes, was made up of Fred Dunkerley, Rolle Mfg. Co., T. M. Hess, Dow Chemical Co., S. Mathey, Quality Castings Co., R. Reilly, Bendix Foundries, and T. Hargitt, Light Metals Inc.

Putting Wasted Experience Back into Use by Industry

C. E. Westover, president, Westover Corp., management consultants, Milwaukee, has developed a plan to put the services of retired and experienced specialists within reach of companies encountering problems outside the experience of the best men in their own organizations.

Westover's special service associates offer expert assistance on a temporary basis from individuals who have achieved outstanding records as specialists in their respective fields. Services of these men are available for specific assignments, on a loan basis, to help with projects which may carry on for a number of months or may last only a week.

Employment of the company's specialists to help through a transition or to solve a specific problem involves no tax deductions, social security payments, company pension plans, or other fringe benefits. Headquarters of the Consulting Div., Westover Corp., are at 3110 West Fond Du Lac Ave., Milwaukee 10, Wis.

Course on Quality Control Is Schedule at Purdue

An advanced short course in quality control by statistical methods will be held at Purdue University June 9-19. Subjects to be covered include significance tests and confidence intervals, linear correlation and regression, single sampling for measurements, and analysis of variance.

For information write to Prof. Irving W. Burr, Comptroller's Office-Adult Education, Memorial Center, Room 110, Purdue University, Lafayette, Ind.

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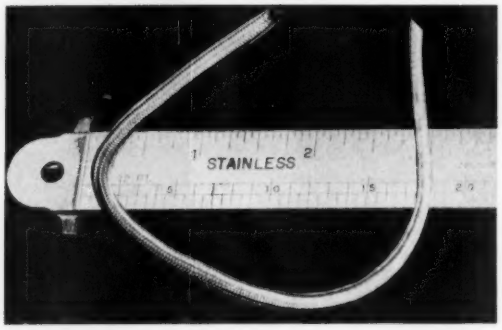
INTRICATE PASSAGES

In Castings Formed by Stainless Steel Braid



Typical braid for cores is made of 0.0036-in., Type 304 stainless. Small diameter provides flexibility

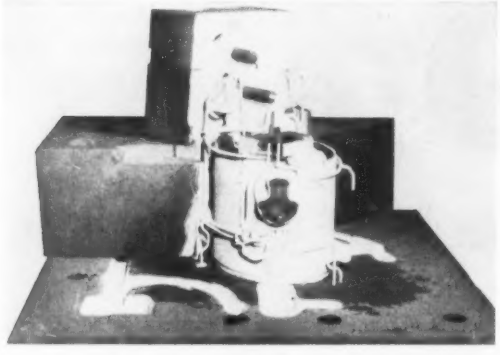
● A NEW, removable coring material made of stainless steel braid permits greater freedom when designing intricate internal passages in magnesium castings.

The core material eliminates costly machining and external piping, upgrades the value of scrapped castings, and reduces the occurrences of blows in the castings. The removable coring is used in a patented casting process by Howard Foundry Co., Chicago.

Cores are made of stainless steel tubular braid designed and manufactured for Howard by the National-Standard Co., Niles, Mich. Intricate, curving passages in the castings can be designed without any restrictions imposed by the limitations of drill jigs or of less-versatile core materials.

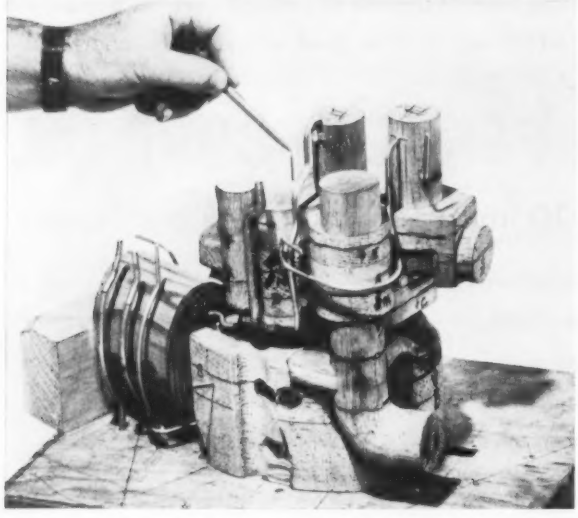
Venting Gases—The coring problem first arose during efforts to improve magnesium castings for such applications as aircraft fuel control blocks. Gases from an organically bonded core are difficult to vent when core diameter is small and core length is great. If such gases are trapped and cannot escape, they may bubble through the metal, causing blows. Furthermore, long thin sand cores distort during the casting process.

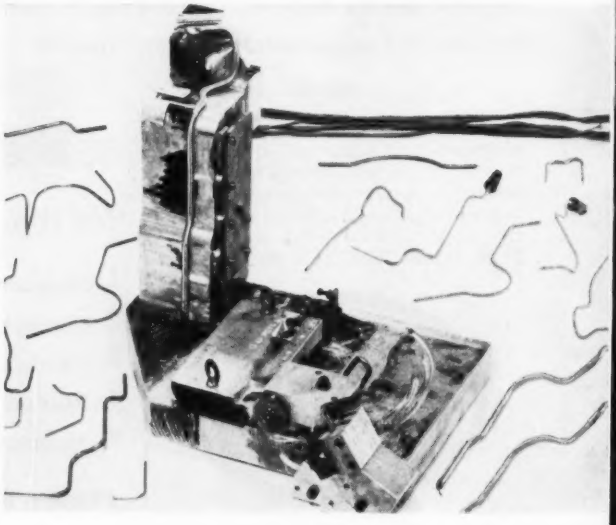
To lick these problems, sand cores often are replaced by metal-tube cores that are bent into shape. After casting, the metal tube is dissolved out or left in. Many combinations



Partly assembled sand mold shows intricate pattern and stainless steel braid cores, of which 13 are employed

Left, below—Pine mockup illustrates design freedom made possible by stainless steel cores. *Below*—Tube bending fixture is simple. Core tubes at right already have been sheathed. "Corks" on sheathed tubes help locate holes in castings. Left, tubes bent into cores are ready for braid





of tubing and sheathing are used by Howard to cast internal passages in other metals. But the problems of casting magnesium with long, thin cores defied the existing combinations.

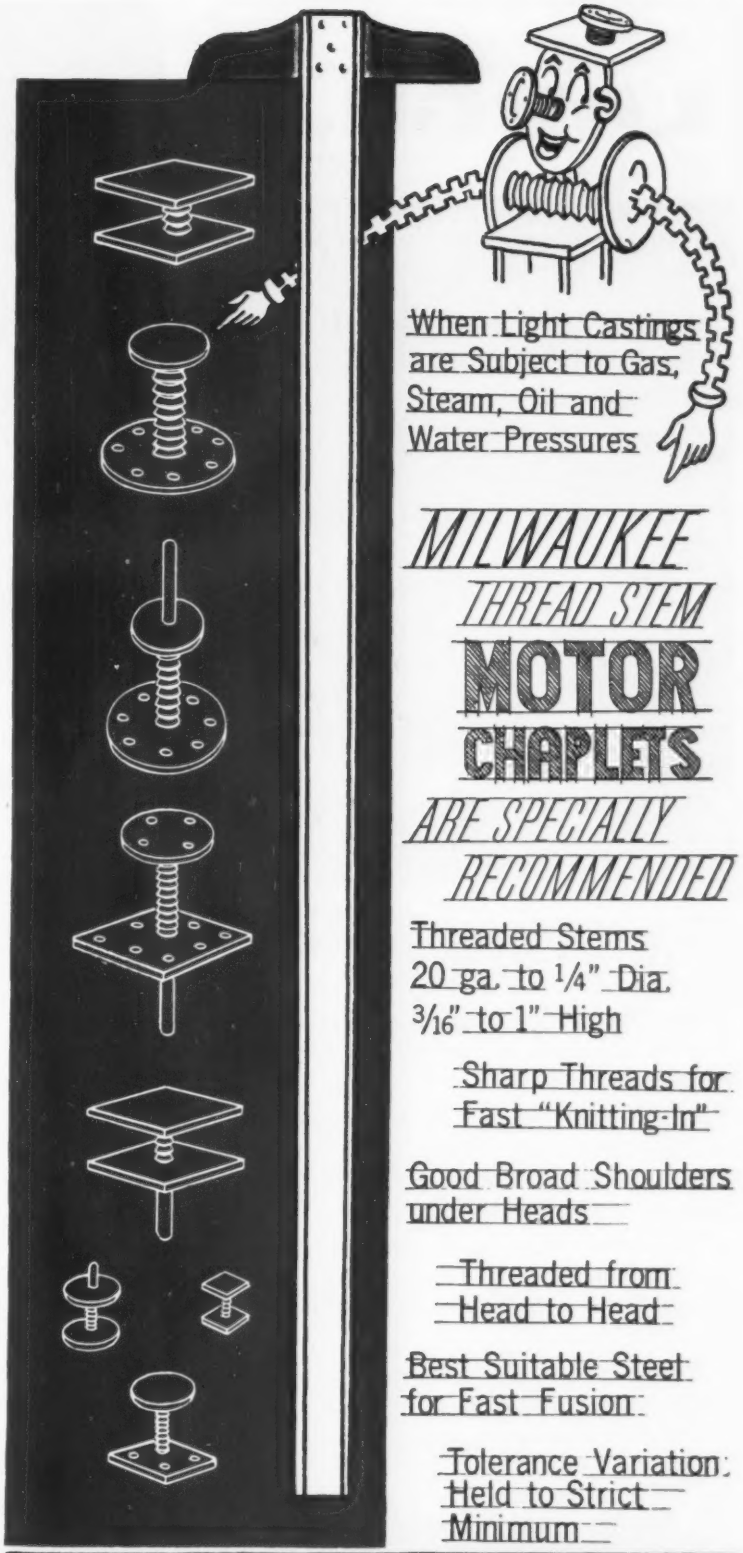
To solve the problem, Howard wanted to use cores made by slipping the stainless steel braided sheath over copper tubing. After the casting solidifies, the copper would be dissolved out with a 50-50 mixture of 70 per cent nitric acid and 70 per cent hydrofluoric acid. The stainless steel sheath then would have to be flexible enough to be pulled out.

When stainless steel braid first was being considered it was found that existing braids were too coarse. But National - Standard developed a braid made of 0.0036-in.-diam Type 304 stainless wire. This small-diameter wire is the key to the flexibility and porosity needed for the braid. It is flexible enough so that a $\frac{3}{8}$-in.-diam braid can be pulled through a $\frac{1}{8}$-in. hole.

Six Sizes Adopted—To make up the sheath for the copper tube, a number of wires are beamed together. These strands then are beamed to form the tubular stainless steel sheath. Either 24 or 48 groups or carriers are used, depending on final braid diameter. Howard has adopted six braid diameters as standard for cores from $\frac{1}{8}$ to $\frac{3}{8}$-in. diam. Sand is used for cores of larger diameter.

This coring system is used to make castings where great freedom is needed in designing passages for oil, fuel, coolant, and hydraulic systems fluid. Integrally cast passages can be branched and tapped in almost limitless configurations.

"My wife bought me a vibrating chair for my birthday"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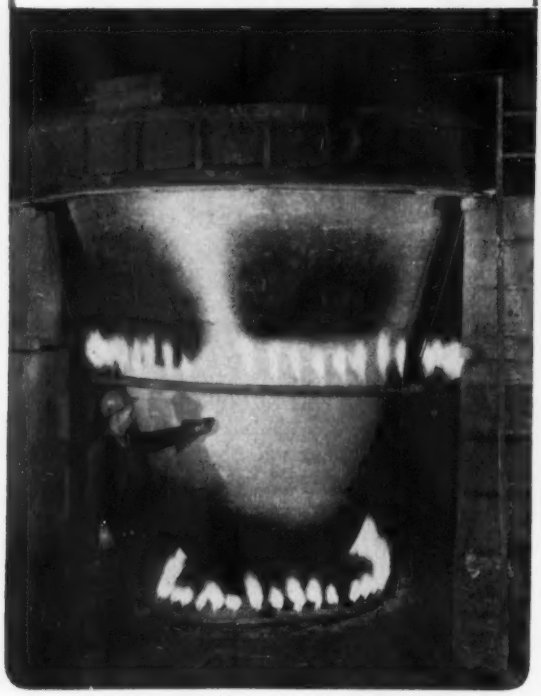

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Regardless of size, metals poured or core process used, we can supply a grade of Penn-Sand to meet your most exacting requirements.

Whether you are pouring steel, gray iron or non-ferrous metals—whether you use core oil, bentonite, cold-set binders, the CO_2 process or make shell cores—Penn-Sand will help you produce better cores at lower cost.

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Men of Industry

● RICHARD S. MOYER
. . . Link-Belt appointment

RICHARD L. GUTENKUNST

THOMAS J. GUTENKUNST
. . . Milwaukee Malleable v. p.'s

● ALLAN R. PUTNAM
. . . managing director, ASM

● **Richard S. Moyer** has been appointed assistant to the vice president, Link-Belt Co., Chicago, with headquarters in Indianapolis. **George Ramsden,** recently appointed assistant general manager, has succeeded Mr. Moyer as general manager of the North Central Div. Mr. Moyer was previously general superintendent of the Pershing Road plant, Chicago.

Hans G. Hinrichs, Cohasset, Mass., recently joined Herman Pneumatic Machine Co., Pittsburgh, as sales representative in New England, eastern and central New York.

William L. Ruth has joined Sterling Grinding Wheel Co., Tiffin, Ohio, as abrasive engineer in the Saginaw Valley area, Michigan. He will reside in Saginaw.

● **Richard L.** and **Thomas J. Gutenkunst** have been elected vice presidents, Milwaukee Malleable & Gray Iron Works, Milwaukee. They will continue to serve in the company's sales department.

Harry C. Ahl has been appointed manager, casting sales, Custom Castings Div., Malleable Iron Fittings Co., Branford, Conn. **J. T. Phelps,** former manager, has become special representative for the division.

● **S. C. Prest** has been named vice president and general manager, Griffin Pipe Div., Griffin Wheel Co., subsidiary of American Steel Foundries, Chicago. Other appointments include **Frank Marold,** vice president-sales, and **O. L. Dean,** manager of operations.

● **Allan R. Putnam** has been appointed managing director of the American Society for Metals. Since 1949 he has been assistant executive secretary of the American Society of Tool Engineers, Detroit, and publisher of *The Tool Engineer*. Mr. Putnam is president of the Council of Engineering Society Secretaries.

Milton A. Karrer, works manager, has been named vice president-manufacturing, Crucible Steel Casting Co., Milwaukee. He joined the company in 1922.

● **Orello S. Buckner,** one of the founders of Bay State Abrasive Products Co., Westboro, Mass., has retired from active participation in the company's operation. He will continue as board chairman. He

FRANK MAROLD

S. C. PREST
. . . Griffin Pipe Div. appointments

O. L. DEAN

● ORELLO S. BUCKNER
. . . announces retirement

MEN OF INDUSTRY

● HAROLD F. SCHULTE
. . . named chief engineer

● M. EARL SAXMAN

● JACK I. COUNTREMAN
. . . Vulcan Mold & Iron Co. promotions

● ARTHUR MOYNIHAN

was president of the company, when it was organized in 1922, until last year.

● **Harold F. Schulte,** for the past year acting chief engineer, has been appointed chief engineer, Wheelabrator Corp., Mishawaka, Ind. He joined the company in 1940.

Kurt A. Miericke was recently named technical representative to foundries, Baroid Chemicals Inc., subsidiary of National Lead Co., Houston. He will continue to maintain his office at Room 1864, McCormick Bldg., Chicago. **C. M. Findlayson** directs sales activities for Baroid Chemicals at 1809 South Coast Bldg., Houston.

● **Harold R. Warsmith** has been named factory manager, Jeffrey Mfg. Co., Columbus, Ohio. He joined the company in 1936. **John R. Simon,** since 1956 machine division superintendent, has succeeded Mr. Warsmith as general superintendent.

● **M. Earl Saxman** has been named plant manager of the Chicago district plant in Lansing, Ill., Vulcan Mold & Iron Co., Latrobe, Pa. **Arthur Moynihan,** formerly production foreman in Lansing, has succeeded Mr. Saxman there as foundry superintendent. **Jack I. Countreman,** who joined the personnel department in Lansing recently, has been appointed personnel manager.

Michael G. Blickensderfer has been made service engineer in Wisconsin, Minnesota, and parts of Illinois and Iowa for Acheson Colloids Co., Port Huron, Mich., with headquarters in Milwaukee. For the past year he has been northern Ohio sales engineer in the company's Cleveland office.

● **Leo M. Elijah** recently joined George Sall Metals Inc., Philadelphia as consultant on metals. He was born in India and was graduated from Bombay University. Later he attended National Foundry College, Wolverhampton, England, and University of Wisconsin before entering American industry. Recently he was with Sylvania Electric Products Inc., New York.

Herman R. Brown has been named sales manager, Payloader Div., Frank G. Hough Co., Libertyville, Ill. **Donald O. Ross,** formerly a district manager, succeeds Mr. Brown as western regional manager. **Robert L. Knox** has been made central regional manager. **Kenneth B. Larkin,** a district manager, has assumed Mr. Knox's duties as eastern regional manager. **Bruce C. Dennett** has been named assistant to the regional managers. **Charles J. Bernard** will direct manufacturers' export sales and scheduling operations.

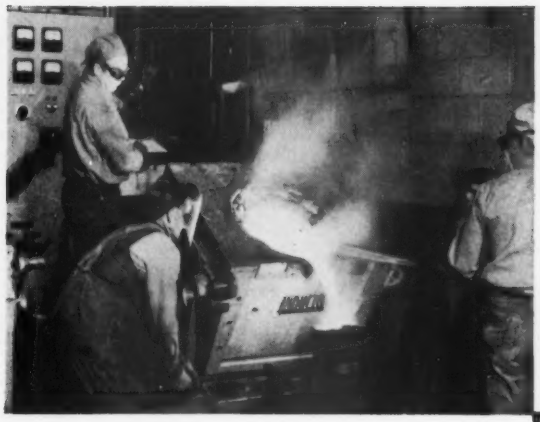
● **Richard H. Koehler** has been named general sales manager, Le Roi Div., Westinghouse Air Brake Co., Milwaukee, succeeding **Jack E. Heuser,** who resigned to join Worden & Risberg, Philadelphia consultants. Mr. Koehler joined the di-

HAROLD R. WARSMITH

JOHN R. SIMON
. . . Jeffrey Mfg. Co. promotions

● LEO M. ELIJAH
. . . joins Geo. Sall Metals

● RICHARD H. KOEHLER
. . . sales mgr., Le Roi Div.



INDUCTOMELTING MEANS*

FEWER CASTING REJECTS

The application of INDUCTOMELTING in ferrous and non-ferrous foundries assures fewer faulty castings. Several related factors contribute to this reduction of rejects . . . such as Inducto's high melting speeds, precise temperature control, electromagnetic stirring action and virtual freedom from gases and slag particles.

Consider the effect of these characteristics on your castings. The melting speeds are so high that oxidation and metal losses are insignificant. Correct pouring temperatures are always achieved—easily—and heat after heat can be exactly duplicated. You maintain close control over melt history. Critical alloys are not lost due to prolonged or excessive heating. Accurate control of alloy chemistry is assured since losses are negligible, even in the more easily oxidized metals. All melts are homogeneous because of the electromagnetic stirring action induced by the furnace. Carbon is not a problem and gas content can be held to a bare minimum.

These factors clearly explain why INDUCTOMELTING contributes to a sharp reduction in casting rejects. Add these savings to low metal losses, efficient operation and faster production and you can readily see how modern Inducto melting equipment has saved more than its cost in many installations over a short period of time.

Write for complete details as outlined in Bulletin 70. Inductotherm Corporation, 412 Illinois Ave., Delanco , N. J.

**INDUCTOMELTING is high-frequency induction melting PLUS the additional advantages of INDUCTO design features and engineering techniques.*

INDUCTOTHERM

INDUCTO . . . the mark of modern melting

Circle 681 on Page 53

MEN OF INDUSTRY

L. B. POLEN
. . . manager of mfg.

● ROBERT W. SUNDEEN
. . . joins Inductotherm Corp.

● ROBERT D. ROSE

● ALEXANDER J. SZABO
Pangborn abrasive engineers

vision in 1952 as sales promotion manager. Recently he has been director of advertising and publicity on the president's staff in Pittsburgh.

● **L. B. Polen,** former Buffalo plant manager, Allegheny Ludlum Steel Corp., Pittsburgh, has been appointed manager of manufacturing for the Forging & Castings Div., which has been expanded to include the Buffalo foundry. Mr. Polen served as superintendent and assistant plant manager there prior to being named plant manager in 1953. He is chairman of the Western New York Chapter of the AFS.

L. West Shea, president, Hanson & Shea Inc., Pittsburgh, has been named executive secretary-treasurer of the Industrial Truck Association, which moved recently from Washington, D. C. to Pittsburgh.

● **Karl K. Breit,** formerly a sales engineer, A. P. Green Fire Brick Co., Mexico, Mo., has been appointed chief sales engineer, Richard C. Remmey Son Co., Philadelphia, a subsidiary.

● **Robert W. Sundeen,** until recently sales and application engineer, Allen-Bradley Co., Milwaukee, recently joined Inductotherm Corp., Delanco, N. J., as sales engineer of induction melting equipment.

● **Clyde H. Wyman** recently joined Exomet Inc., Conneaut, Ohio, as manager of the alloy division. Previously he was chief metallurgist, Burnside Steel Foundry Co., Chicago, and chief foundry metallurgist, L. F. M. Mfg. Div., Rockwell Mfg. Co., Atchison, Kans. Mr. Wyman is a past president of the Electric Metal Makers Guild and has served on various committees of the Steel Founders' Society of America.

● **Robert W. Gregory,** formerly industrial products salesman in the Davenport, Iowa, office, Kaiser Aluminum & Chemical Sales Inc., Chicago, has been named Indianapolis branch manager. He joined the company in 1954.

● **Alexander J. Szabo** and **Robert D. Rose** have been named abrasive sales engineers in the Detroit office, Pangborn Corp., Hagerstown, Md. Mr. Szabo has been working with blast cleaning equipment since he joined the company in 1955. Mr. Rose has been with Industrial Metal Abrasives Co., Jackson, Mich., for nine years. **Clifford S. Mehelich,** formerly with Minnesota Mining & Mfg. Co., St. Paul, has joined the company and will specialize in applications of vacuum cast steel shot.

James C. Branham has been appointed northern California representative for Ferro Cast (Investment Casting) and the Electronics Div., J. B. Rea Co., Santa Monica, Calif.

● **C. C. Shearer** has been named Cleveland district sales manager, Bohn Aluminum & Brass Corp., Detroit, succeeding **James Withing-**

● KARL K. BREIT
. . . chief sales engineer

● CLYDE H. WYMAN
. . . Exomet division mgr.

● ROBERT W. GREGORY
. . . becomes branch mgr.

● C. C. SHEARER
. . . Bohn district mgr.

MANHATTAN PORTABLE WHEELS

REMOVE *MORE* METAL AT LOWER COST

Fast cutting action *plus* long wheel life add up to more output per man hour . . . lower production costs with Manhattan Portable Wheels. Every specification of the wheel you use—type of abrasive, grain size, hardness, structure and bond—is determined only after a careful analysis of your grinding problems . . . the amount of metal *you* want to remove, and the finish *you* require.

Workers prefer Manhattan Portable Wheels because they get more pieces done. Management prefers them because they assure faster, more uniform quality production . . . and they last longer.

Flared cup, depressed center, cone, plug and mounted point, or straight—there's a Manhattan Portable Wheel engineered for your job requirements. Ask about the new Safety-Back Flared Cup Wheel. Let a Manhattan representative show you how to remove *more* metal, *faster* . . . get "More Use Per Dollar" . . . with Manhattan Portable Wheels and other types of high speed, heavy duty abrasive wheels.

FASTER CUTTING ACTION

LONGER WHEEL LIFE

CUSTOM-MADE FOR YOUR JOB

RM949

GRINDING WHEEL INSTITUTE MEMBER

WRITE TO THE ABRASIVE WHEEL DEPARTMENT

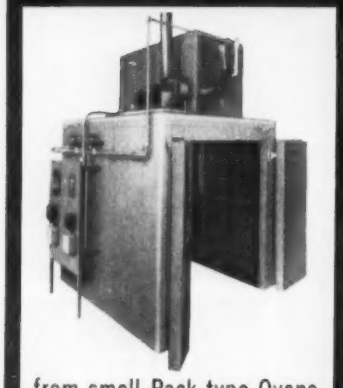
MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

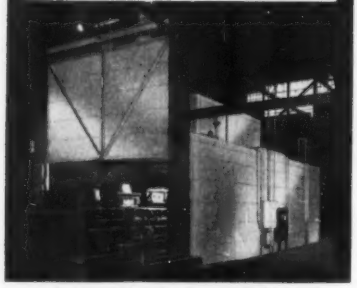
Belts • Hose • Roll Covering • Tank Linings • Industrial Rubber Specialties • Abrasive and Diamond Wheels • Brake Blocks and Linings • Clutch Facings • Asbestos Textiles • Mechanical Packings • Engineered Plastics • Sintered Metal Products • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls

Circle 682 on Page 53

LANLY heat processing equipment for the FOUNDRY INDUSTRY



from small Rack type Ovens to the BIG CAR TYPE OVENS



If a need arises to replace or improve your Foundry Ovens, it is only logical to look to LANLY, recognized authorities in the design and construction of heat processing equipment for more than 22 years.

TODAY may be the opportune time to survey your present facilities and request the counsel of a LANLY representative at no obligation.

THE lanly CO.

FOUNDRY OVENS 2800 Euclid Avenue • Cleveland 15, Ohio

write for FREE bulletin

Find Your Representative in The Yellow Pages

Atlanta, Georgia Birmingham, Ala.
Boston, Mass. Chicago, Ill Cleveland, Ohio
Columbus, Ohio Detroit, Mich.
Rochester, N. Y. Pittsburgh, Pa.
San Francisco, Calif St. Louis, Mo.

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● **SAMUEL A. GLUECK**
. . . joins H. Kramer & Co.

● **WILLIAM R. SWICK**
. . . assistant district mgr.

ton, who has retired after holding the position many years. Mr. Shearer formerly was production manager of one of Bohn's Detroit plants.

● **Samuel A. Glueck** has been appointed assistant to the president, H. Kramer & Co., Chicago. He has been with Federated Metals Div., American Smelting & Refining Co., New York, for 25 years, recently as midwestern department general manager in Whiting, Ind.

James W. Long has been named manager of sales-engineering, Magnesium Alloy Products Co., Compton, Calif. **Robert L. Oeffner** has been named sales engineer. **Gilbert Finch** was recently named supervisor in charge of the special alloy department. Messrs. Long and Oeffner were with Dow Chemical Co., Midland, Mich., prior to joining the company. Mr. Finch was manager of the magnesium foundry, Howard Foundry Co., Chicago.

Chelsea R. Phillips has been named Chicago district sales manager, Robins Conveyors Div., Hewitt-Robins Inc., Stamford, Conn., with headquarters in Melrose Park, Ill. **Paul D. Willard** has succeeded Mr. Phillips as sales manager in the Minnesota mining area, centered in Hibbing. Mr. Willard has been with Erie Mining Co., Aurora, Minn.

John W. Rhoads has joined Bruce & Conreaux Co., Indianapolis, as foundry and coreroom supplies representative. He will also act as a consultant to foundries on installation of special processes or production problems.

● **William R. Swick** has been appointed assistant district manager in the New York area, W. W. Sly Mfg. Co., Cleveland, with headquarters in Jersey City, N. J. He joined Sly two years ago.

James W. Ferguson, since 1948 assistant product manager, industrial resins, Durez Plastics Div., Hooker Chemical Corp., North Tonawanda, N. Y., has been named manager of field sales for the division. He joined Durez in 1931.

James P. Spresser has been appointed manager-planning, standards, and methods, and **Bernard J. Alperin,** supervisor-inspection, Everett Foundries, General Electric Co., Everett, Mass. Mr. Spresser has been in Schenectady for the past year in the foundry department's long range planning study. Since 1957 Mr. Alperin has been development engineer for the Applied Research and Development Laboratory of the foundry department there.

Harold W. Nelson, formerly manager of research in the research and development department, Great Lakes Carbon Corp., New York, has been named technical director of the carbon division at the research center in Morton Grove, Ill. Mr. Nelson joined Great Lakes Carbon in 1940.

Adam Dunlop has resigned as development manager of the exothermic division, Foundry Services International Ltd. Mr. Dunlop and **J. P. P. Jones** have formed Investril Casting & Metallurgical Services Ltd. for consultation with particular reference to investment precision

NEW SERIES IR DRILLS...

NEW designs NEW speeds NEW power to give you an

ANNUAL DIVIDEND on your PAYROLL DOLLARS

If your operators are using older model drills, you can increase their man-hour productivity by as much as $2220 Payroll Dollars in one year, just by replacing the older tools with these new, more efficient I-R tools.

Multiply these *Annual Dividends* by the number of drill operators in your plant, and you can see why management today is taking a new look at portable tool operations.

There's a fast, easy way to calculate the amount of *Dividend on Payroll Dollars* these new I-R drills can help you earn in just one year—without adding to your present payroll.

It's yours without obligation. To get it, call your I-R AIRengineer today. Or write Ingersoll-Rand, 11 Broadway, New York 4, N. Y.

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Ingersoll-Rand

Tools plus AIRengineering increase output per man

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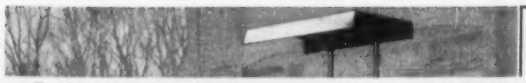

Too busy to "get away" to inspect a proposed installation? SEE

REVECON
FURNACE

Mobile Demonstration Unit

—a traveling working Revecon Furnace available for

Free Demonstration At Your Foundry

Here's what a Demonstration will prove right in your own Foundry under your working conditions using your metal:

- Melts 100 lbs. Aluminum in 12 min. using 0.7 gal. oil or 100 cu. ft. gas*.
- Melts 200 lbs. Brass/Bronze in 20 min. using 1.2 gal. oil or 130 cu. ft. gas* per 100-lbs.
- Melts 175 lbs. Copper in 35 min. using 1.5 gal. oil or 150 cu. ft. gas* per 100-lbs.
- Melts 100 lbs. Iron in 55 min. using 3.4 gal. oil or 360 cu. ft. gas*.

* 1040 BTU gas.

Metal loss: Al—under 1%; Brass/Bronze—under 2%.

See HOW and WHY Revecon Saves You 50% of your Melting Costs

Check your present costs against these Savings and you can't afford to miss this Demonstration at your Foundry. Unit is 9' high including spark arrester, 12' long, 79½" wide. Oil or gas fired.

For Details on FREE DEMONSTRATION Write

International Foundry Supply Co., P. O. Box 1053, Reading, Pa. phone: FR 6-0794

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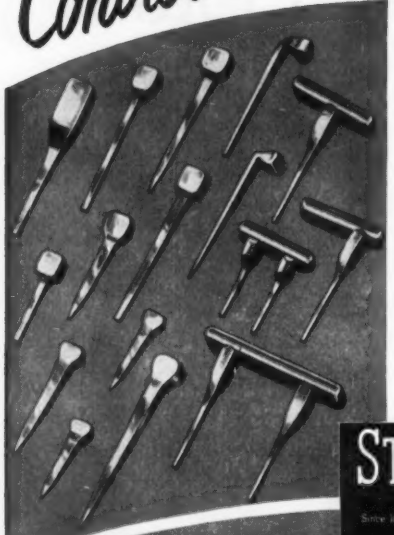
Control Foundry Chilling with

CHILL KOOLHEAD NAILS



CHILL NAILS and SPIDERS

Choose any style chill nail from jumbo to stubby; slim, medium, or horse nail blade; blunt, pointed, straight or 90° bent. Some types available in Stainless, Brass, Aluminum; Copper coated to order. Spider Chills, jumbo or horse nail legs—double or single. Available in various sizes and types; also made to your individual specifications.

Write for detailed descriptions and prices.

STANDARD HORSE NAIL CORP
Since 1872
NEW BRIGHTON PA

Other Products

PINS Stanho KEYS
SPECIAL PARTS

casting. Mr. Dunlop is managing director of the new company, which will act as agent for the process patented by **Nicholas Herzmark,** known as the Plycast method.

H. G. Coffey, former president, Aetna-Standard Engineering Co., has been named vice president-general manager, Aetna-Standard Div., Blaw-Knox Co., Ellwood City, Pa., recently acquired by Blaw-Knox.

• **Reginald B. Beam** has been named Chicago industrial district manager, Joseph Dixon Crucible Co., Jersey City, N. J., succeeding

• **REGINALD B. BEAM**
. . . Chicago district mgr.

Emory Bleam, who retired recently after 36 years with the company. Mr. Beam joined the company in 1925 and in 1933 was transferred from the standards department in Jersey City to Chicago as sales representative for crucible and refractory products.

Leonard R. Mehlman has been named staff engineer assigned to the castings design project, American Society for Metals, Cleveland. Under the society's publications development division, the project involves preparation of a castings design and producibility manual for Air Force procurement officers and suppliers. **Dr. Taylor Lyman** is division director.

Paul J. Reeves has been appointed vice president-sales, Timken Roller Bearing Co., Canton, Ohio, succeeding **W. B. Moore,** retired. **Robert G. Wingerter** has been made director of sales, **S. T. Salvage,** general manager of the automotive division, **Norman H. Peterson,** adver-

BOOKS
FOR FOUNDRYMEN

Our Book Department carries a wide variety of books of particular interest to foundrymen. Here are some titles presently available. If you are seeking a title not listed, write us—we'll be glad to get it for you.

PRINCIPLES OF METAL CASTING

By Richard Heine and Philip Rosenthal. Covers every step of standard foundry processes . . . explains what equipment is used for each phase, when and how it is used . . . and describes proven procedures that make for greater economy in metal casting. Crammed with photographs and illustrations. —$7.50

STEEL FOUNDRY PRACTICE

By John Howe Hall. A comprehensive sourcebook covering all phases of modern steel foundry practice. Contains practical information on almost every production problem steel foundrymen encounter. —$12.00

THE CUPOLA AND ITS OPERATION

Latest developments, such as hot blast, basic lining for nodular iron, and emission control are covered. Chapters such as those on refractories, principles of combustion, and metallurgy have been greatly augmented or are presented for the first time. More than 50 of the country's outstanding foundrymen have contributed their knowledge and experience to this book. —$9.50

CAST METALS HANDBOOK, 4TH EDITION

Every modern thinking product designer needs this handbook. Contains reliable working data for utilizing the properties of cast metals to the greatest engineering advantages—unbiased and substantiated information on new, reliable developments in cast materials—practical, up-to-date facts on HOW to get the most out of castings designs. —$10.00

BRASS AND BRONZE FOUNDRY PRACTICE

By Harry M. St. John

Now brass founders have available a comprehensive modern treatment of all aspects of brass foundry theory and practice in one source.

It covers the entire range of brass foundry operations and its 23 chapters discuss alloys, technical and operating procedure, quality control, testing, brass foundry economics, cost control, casting design, patternmaking, foundry layout, and salvage of waste material. The text is supplemented by 85 illustrations which clarify and enlarge on the subject matter.

250 pages, 85 illustrations
6 x 9, cloth bound
Price $8.00

FUNDAMENTALS IN THE PRODUCTION AND DESIGN OF CASTINGS

By C. T. Marek. Stresses the fact that economy of production is a basic requisite of good casting design. Techniques, skills and practices in casting production are developed to support the principal objective—correlating casting design with economical production. —$5.25

NONFERROUS FOUNDRY METALLURGY

By A. J. Murphy. Covers general principles unifying foundry techniques of all industrial nonferrous metals in relation to metals in the liquid state, to the process of solidification and to the factors influencing properties of casting. 497 pages. —$12.50

METALLURGY OF STEEL CASTINGS

By Charles W. Briggs. A comprehensive work. Provides complete information on methods of technical and industrial control in production of steel castings and describes every manufacturing process used. —$11.00

FOUNDRY CORE PRACTICE

Over 100 leading authorities on foundry problems collaborated with the author, Harry W. Dietert, to pool their knowledge in making this the type of book that is of maximum benefit to the foundry field. —$10.00

METALLURGY FOR ENGINEERS

By J. Wulff, H. F. Taylor and A. J. Shaler. This book is written from the metallurgical rather than the shop point of view and aims to give the reader "an adequate understanding of metals so that he may intelligently select and use them." 624 pages, 290 illus. —$7.25

BASIC COST PRINCIPLES FOR NONFERROUS FOUNDRIES

An up-to-the-minute guide for costing in both small and large foundries. Prepared by practical foundrymen, book is based on 10 years' research and experience under Government pricing regulations. —$5.00

FOUNDRY, BOOK DEPT., 1213 W. 3rd St., Cleveland 13, Ohio

Please send (postpaid) the following books I have checked:

- ☐ Principles of Metal Castings
- ☐ Brass and Bronze Foundry Practice
- ☐ Cupola and Its Operation
- ☐ Cast Metals Handbook
- ☐ Fundamentals in the Production and Design of Castings
- ☐ Nonferrous Foundry Metallurgy
- ☐ Metallurgy of Steel Castings
- ☐ Steel Foundry Practice
- ☐ Foundry Core Practice
- ☐ Basic Cost Principles for Nonferrous Foundries
- ☐ Metallurgy For Engineers

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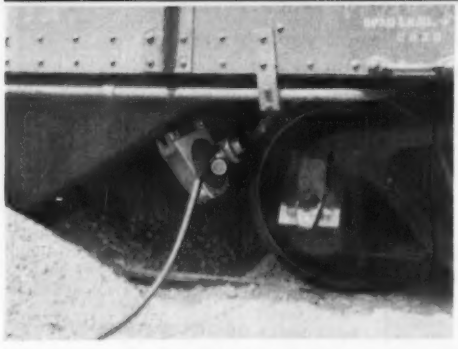
CITY AND STATE _____

Enclosed is $_____. ☐ Company Order ☐ Money Order ☐ Check

Orders for delivery in Ohio—add 3% to cover state sales tax.

VIBROLATOR®

Heavy duty vibration inducer
SOLVES COKE UNLOADING PROBLEMS



This light weight vibrator has been proved 100% effective for removal of coke from hopper cars.

High-amplitude vibrations • Shock and spark proof • Pneumatically driven • Quiet operation • Precise control through a range of a few cycles per second to 60 cycles per second

Starts wet or dry materials moving—and keeps them flowing from railroad cars, massive hoppers, bins, chutes or conveyors. Pneumatically driven, the CCVP operates at low-noise level in all frequencies. Portable, with its own mounting clamps, unit can be mounted in any position or angle convenient to the job. Unconditionally guaranteed to give satisfaction.

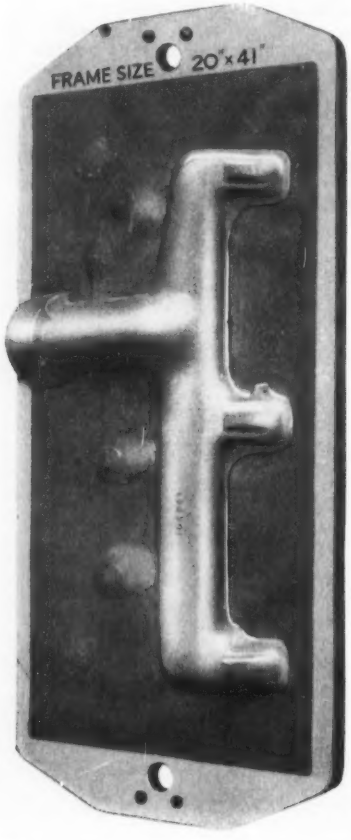
*"Vibrolator" is Martin Engineering's registered trade mark for its vibration inducers and vibrator accessories.

CALL YOUR DISTRIBUTOR OR WRITE FOR FREE CATALOG

MARTIN ENGINEERING COMPANY 704 Fountain St. Neponset, Illinois

"Vibrolator" vibrators are available in a wide range of sizes "pocket watch" to the most powerful hand-portable unit built.

Circle 687 on Page 53



"The type of work we produce in TAMASTONE we would be unable to make at all in the absence of skilled help"

COLUMBUS BRASS & ALUMINUM CO., INC.
Columbus, Indiana

This Drier pattern for a diesel intake manifold is made from an original master pattern. *Only one skrinkage!* Pattern was used for 500 pieces. Only 3½ hours labor and 50 pounds of TAMASTONE were required. Up to 1,000 castings have been made from a plate of this type!

No special skill needed to increase production 400% or more! . . . WRITE . . .

TAMMS INDUSTRIES CO.
228 N. LaSalle Street
Chicago 1, Illinois

tising manager, and **W. Roderic Covey,** assistant advertising manager. Mr. Reeves has been director of sales since 1951.

• **Lawrence H. Hodges** has been appointed manager of the Rockford, Ill., plant of J. I. Case Co.,

● **LAWRENCE H. HODGES**
. . . plant mgr., J. I. Case

Racine, Wis. Previously he was assistant design and research engineer and since 1955 chief product engineer at the Rockford plant.

• **Robert H. Culbert,** formerly with Hart Industrial Supply Co., Tulsa, Okla., has joined Cleco Div., Reed

● **ROBERT H. CULBERT**
. . . joins Cleco Div.

Roller Bit Co., Houston, as sales representative in Arkansas, the Texas Panhandle, and Oklahoma, with headquarters in Tulsa.

Thomas Trowbridge has been named general sales manager and Thomas G. Gilcoyne, field sales manager, Coated Abrasive Div., Behr-Manning Co., Troy, N. Y. Mr. Trowbridge was named eastern regional sales manager in 1948, as-

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sistant sales manager in 1955, and sales manager in 1956. Mr. Gilcoyne has served as New York divisional manager, manager of general trade sales, and for the past year was manager of industrial sales.

Henry A. Roemer Jr. has joined Pittsburgh Metallurgical Co., Niagara Falls, N. Y., as Cleveland district office manager. He was formerly president, Sharon Steel Corp., Sharon, Pa.

• **Richard E. Sutherland** has been named sales manager, the S-P Mfg. Corp., Solon, Ohio. Prior to joining the company two years ago he was with the Weatherhead Co., Cleveland.

• **RICHARD E. SUTHERLAND**
. . . sales mgr., S-P Mfg. Corp.

Donald R. Stewart has been made district manager of grinding wheel sales in Michigan and northeastern Ohio, Simonds-Worden-White Co., Dayton, Ohio. **Kenneth E. Melvin** has been named sales representative under Mr. Stewart. Headquarters will be Detroit.

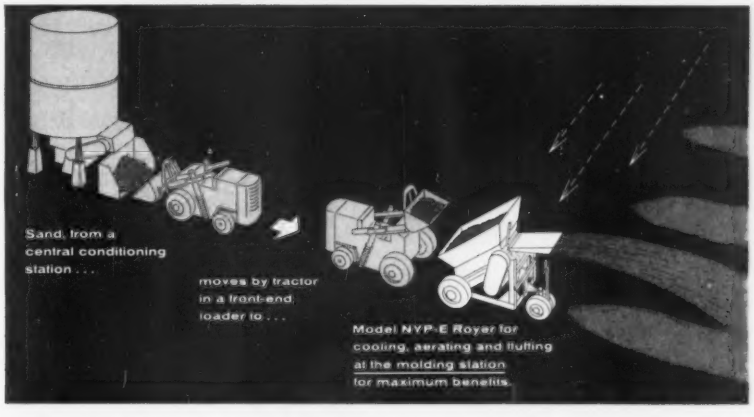
Leslie F. Schurck has been made director of industrial engineering, Cooper Alloy Corp., Hillside, N. J. He was formerly with Fairchild Engine & Airplane Corp., Hagerstown, Md. **Ramon J. Galvez Jr.** has been appointed supervisor of radiology.

James Mitchell, formerly in the Philadelphia sales district, Harbison-Walker Refractories Co., Pittsburgh, has been appointed district sales manager in the Colorado area with headquarters in Canon City. He has been with the company since 1946.

SAND CONDITIONING TOPICS

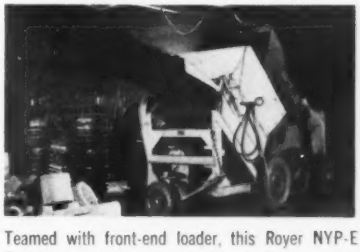
PUBLISHED BY ROYER, MANUFACTURERS OF THE FOREMOST IN SAND CONDITIONING EQUIPMENT

ROYER


Sand, from a central conditioning station . . .
moves by tractor in a front-end loader to . . .
Model NYP-E Royer for cooling, aerating and fluffing at the molding station for maximum benefits.

THERE IS A SAND CONDITIONING SYSTEM TO FIT YOUR BUDGET . . .

Here is a positive cost-cutting sand conditioning system that falls within the budget limitations of the small or medium semi-mechanized foundry. It delivers better sand without adding to time or manpower requirements, and without the expense of complete mechanization. It gains the advantages of fluffing after handling, as the final step at the molding station.



Teamed with front-end loader, this Royer NYP-E Portable moves from floor to floor in this grey iron foundry. What used to be caked, packed sand from mulling is now a cool, fluffy pile.

An integral part of this practical system is the Royer Model NYP-E Sand Separator and Blender. It can be moved swiftly from station to station, delivering cooled, aerated, fluffed, perfectly conditioned sand right where it's wanted. With this Royer you can really get all the advantages of central system sand control.

Your system is probably "different." There's still a versatile unit of the Royer "NY" Series to fit it . . . and improve it. As a stationary model, the "NY" will fit into a conveyor system, or can be installed to take the discharge of stiff sand directly from your muller. However you use it, the Royer vastly improves sand, saves time and money, improves yield and quality of castings —all at a fraction of a cent per ton of sand.

We'll be happy to have an experienced, foundry-wise Royer agent call to help you work out the system that's best for your operation. Or, if you prefer, we'll rush you a copy of Bulletin NY-54, giving further information about these units and how you will benefit from them. When you're convinced, *you* can call in your Royer agent and take the first step towards better sand with a Royer system.

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Around the Country

NEWS REPORTS FROM

Chicago . . . Boston . . . Philadelphia . . . Pittsburgh

Chicago—Dr. L. F. Mondolfo, head of the Metallurgical Engineering Department of Illinois Institute of Technology, has announced completion of plans for the modernization of the foundry at the institute here.

A special Industry Advisory Group headed by C. V. Nass, Beardsley & Piper Div., Pettibone Mulliken Corp., has spearheaded the modernization program. This group, which includes M. J. Allen of American Steel Foundries, R. L. McIlvaine of National Engineering Co., and W. O. McFatridge of International Harvester Co., is now actively engaged in obtaining required equipment from industry. Space to house the expanded foundry will be allocated by Illinois Institute of Technology authorities as part of its over-all expansion program already under way.

Illinois Tech has been a member school of the Foundry Education Foundation for some years and has played a vital part in the preparation of engineers for the foundry industry. Mitchell Silverstein is the faculty member in charge of the foundry program.

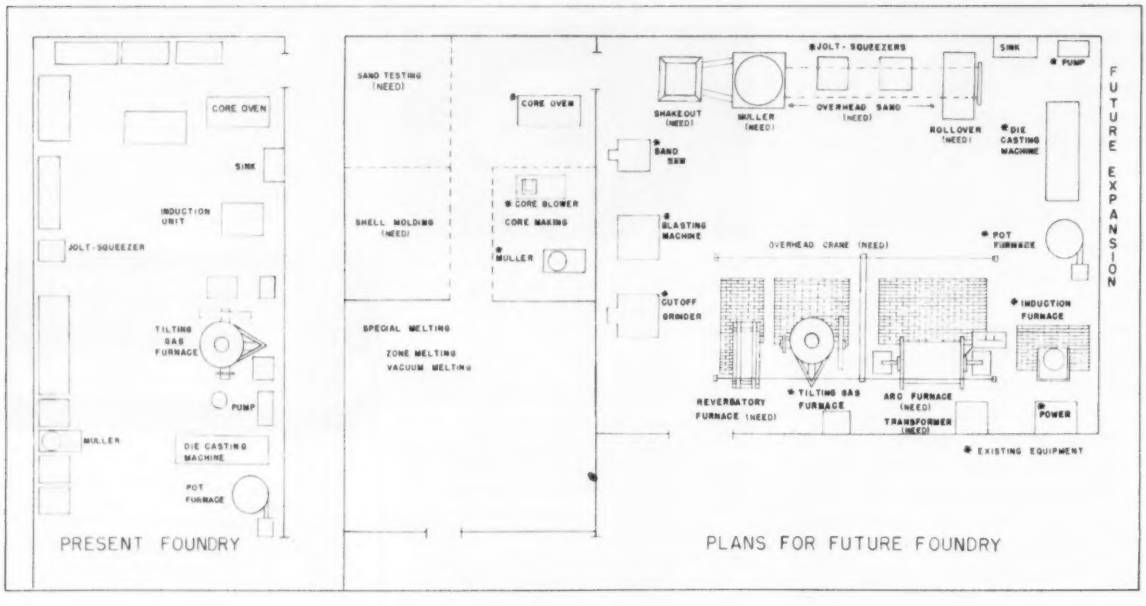
The school's foundry, while a part of the Metallurgical Engineering Department, is used regularly by students of the other engineering departments. Over two hundred and fifty students each year obtain foundry training and use the foundry facilities.

Philadelphia—Foundry business generally is more active. Gray iron job shops are averaging around 75 per cent of normal capacity, and a betterment also is noted among the malleable and steel foundries. Nonferrous shops are operating fairly well, but there has been little if any improvement over the past few weeks.

In gray iron, light and medium work still dominates, including good demand from manufacturers of material handling equipment and power transmission machinery. Specifications are better for tobacco processing machinery. Also, manufacturers of pumps are beginning to farm out work. This does not necessarily mean, however, that they are operating their own shops with full manpower. They are still not too sure about the outlook and, accordingly, are moving cautiously in the employment of more help.

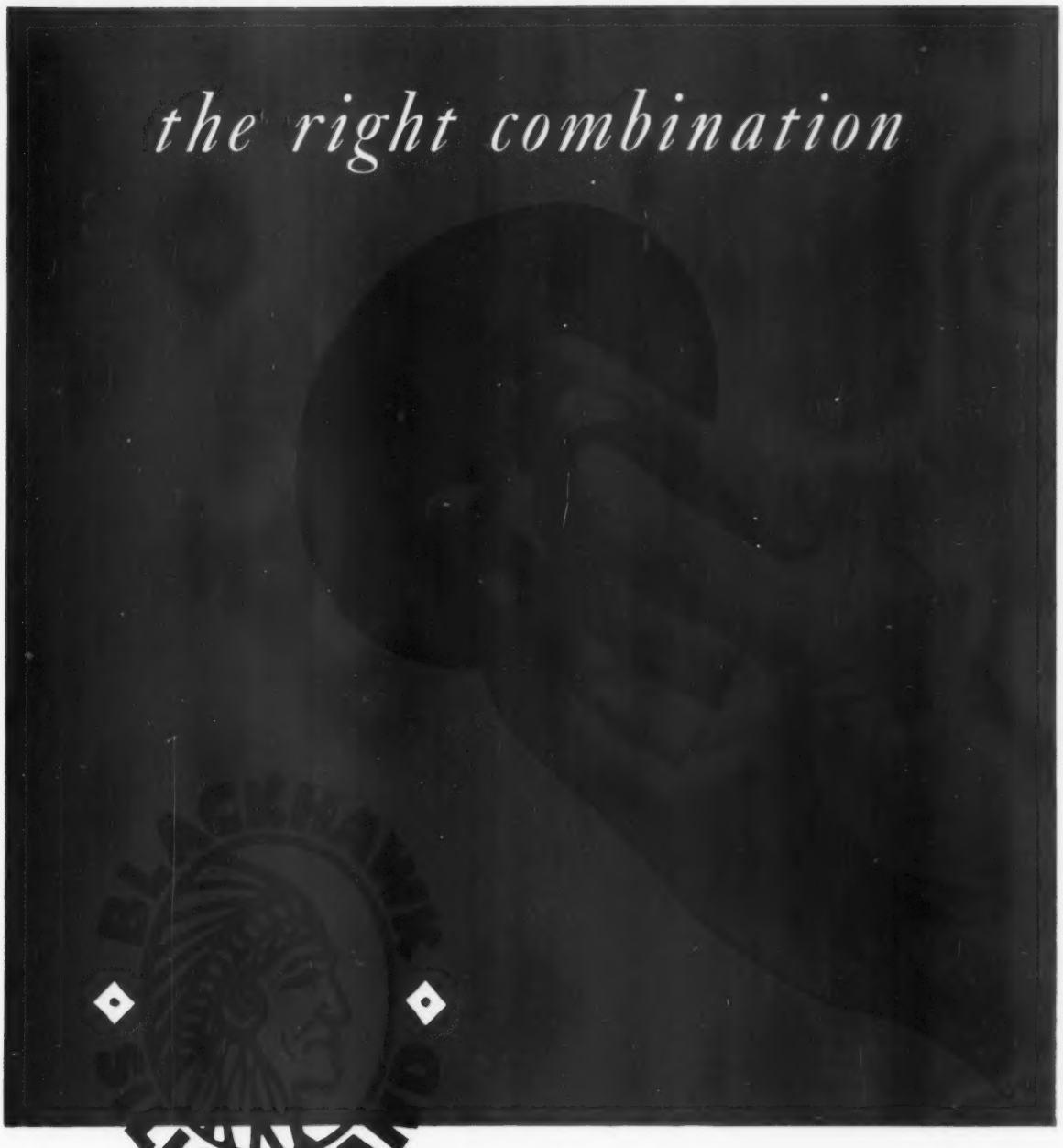
While still lagging, heavy gray iron casting work is definitely better than a month ago. Auto die work has helped the situation; also specifications for papermaking machinery. In some adjacent areas, however, notably northern New Jersey, the over-all market is spotty and without too much depth. Various foundries are operating five days a week, but still with less than normal working forces. Modest improvement in machine tool orders hasn't yet been reflected to any extent.

Malleable shops are doing well. There is good demand for building and automobile hardware. Movement of pipe fittings is brisk. Electrical components are taking



Layouts of present and proposed foundries at Illinois Institute of Technology, Chicago

the right combination



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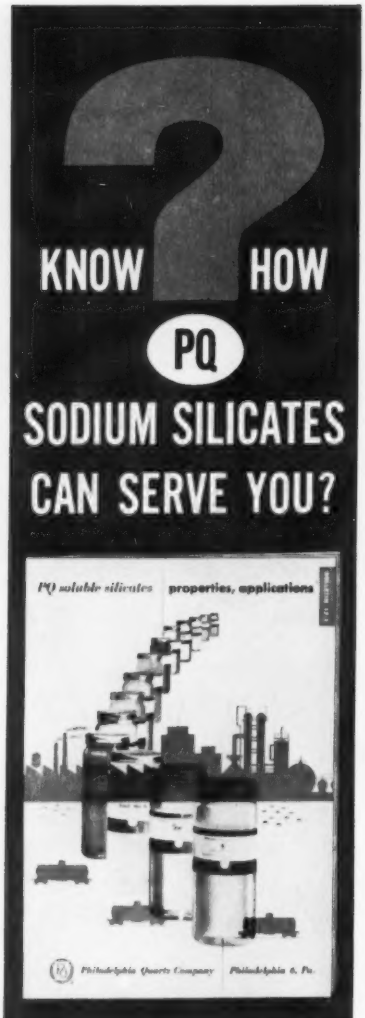

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Circle 691 on Page 53

relatively good tonnage. Some shops are operating in excess of 80 per cent of normal, with backlogs accumulating.

While it is questionable if district steel foundries are averaging better than 70 per cent of normal, they are doing better than they were. One shop is now operating five days a week, double shift. Lag in heavy industrial equipment generally continues to be reflected, though.

An overflow of meter work is helping out some of the red metal jobbers. Also considerable plumbing work is available, but price competition is strong. In light metals, demand is diversified and fairly active.

Pittsburgh—First quarter shipments of steel foundries were considerably larger than those of fourth quarter, 1958. Individual companies report gains of 10 to 30 per cent. Railroad buying has improved appreciably, but the pickup in industrial castings has been slight.

The competitive situation in industrial castings is still "horrible," a sales executive declares. "Prices are being cut below 1956 levels," he adds. "There have been two increases since 1956 but both were nullified by recent reductions."

For the first time in many months, steel foundries have backlogs. One of the largest has enough work to sustain operations at the current level through June. It's working 40 hours a week with 80 per cent of its maximum force. Another firm has a six-week backlog. Operating at 60 per cent of capacity, it expects second quarter shipments to be on a par with those of the first three months. "We've seen improvement for two reasons," a company spokesman declares. "Some buyers finally got down to bedrock on their inventories. Others are hedging against a threatened midyear steel strike." The marked improvement in roll sales can, of course, be attributed to the recent surge in steel production.

Although it has "no backlog to speak of," one of the district's largest gray iron shops admits that "things are looking a little better." During the first three months of the year its tonnage was double that of fourth quarter, 1958. Having recalled all of its furloughed employees, it's running at 75 per cent of capacity.

Some of the "blue chip" industrial firms used last year's slack periods to modernize their foundries. There's been no letup in the trend toward installation of equipment that will reduce labor costs and improve the quality of castings.

Barring a prolonged strike, most foundrymen believe the second half of 1959 will be about 10 per cent better than the first. They look for continued strength in railroad buying and a gradual uptrend in spending for capital equipment.

Boston—Gray iron and malleable foundries will maintain melt schedules through May close to the slightly higher April rate.

Textile mill equipment shops are more active, and one, Draper Corp., Hopedale, Mass., is operating two shifts, although still taking in some jobbing work. In some cases, notably malleable shops, moderate backlogs have been accumulated, but for the most part consumers of iron castings are buying for immediate requirements.

Demand for castings is on broader basis and the low point for machine tools has probably been turned. Slight but steady improvement is looked for as the year progresses. Inventories are low among both producers and users; more shops are operating on five-day week schedules, although not with full crews.

Casting prices are highly competitive, but basic raw materials are unchanged. Mystic Iron Works, Everett, Mass., will hold No. 2 foundry at $68, f.o.b. furnace, through June.

Belcher Iron Works, Easton, Mass., is installing a 48-hour cycle electric annealing furnace, replacing an oil-fired installation; this will reduce annealing time by more than half for some work.

Brass and bronze shops generally are operating full five days with backlogs for May slightly heavier. Walworth's plant at Braintree, Mass., is trying to build up inventory, having lowered stocks substantially over recent weeks. Among the brass and bronze shops there has been some inventory buying of ingots. Grinnell Corp., Cranston, R. I., will continue five-day schedule through May.

PROPERTIES OF CAST MALLEABLE

Considered at Marketing Conference

● A NEW seminar type program brought added interest and participation in the 10th Market Development Conference of the Malleable Founders' Society, held April 8-9 at Wade Park Manor, Cleveland. All of the important properties of malleable iron and pearlitic malleable iron were considered from the standpoint of influence on sales.

Mechanics for handling the seminars was well organized and functioned smoothly. Participants were divided into four groups according to the color of the registration badge. Four seminars were held simultaneously, and groups shifted to another session every 40 minutes. Thus, during the morning, each group attended all four seminars. In the afternoon, the entire conference met for a report on the seminars and general discussion of the various topics.

At the two morning sessions, the following seminars were held:

Design Adaptability: Thomas Kirby, Northern Malleable Iron Co., St. Paul, discussion leader; Thomas M. Blank, Pennsylvania Malleable Iron Co., Lancaster, Pa., technical adviser-production; R. J. Franck, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., technical adviser-design.

Strength and Toughness: H. M. Kirkby, Marion Malleable Iron Works, Marion, Ind., discussion leader; L. E. Emery, Marion Malleable Iron Works, technical adviser.

Machinability: James W. Hallock, Albion Malleable Iron Co., Albion, Mich., discussion leader; Prof. O. D. Lascoe, Purdue University, Lafayette, Ind., technical adviser.

Other Properties: These properties included selective hardening, corrosion resistance, and electrical and magnetic properties. L. D. Auker, Eastern Malleable Iron Co., Naugatuck, Conn., and John B. Palmer, Albion Malleable Iron Co., Albion, Mich., discussion leaders; Hans J. Heine, Malleable Founders' Society, technical adviser.

Engines and Compressors: Jack Wagner, Wagner Castings Co., Decatur, Ill., discussion leader; Robert F. Carr, Quincy Compressor Co., Quincy, Ill., technical adviser.

Automotive Transmissions: Dale Marek, Central Foundry Division, Saginaw, Mich., discussion leader; Ralph Beck, Detroit Transmission Division, Ypsilanti, Mich., technical adviser.

Agricultural Implements: Eugene K. Simonsen, Belle City Malleable Iron Co., Racine, Wis., discussion leader; John Bramow, Belle City Malleable Iron Co., technical adviser.

Imagineering and Diversification: Donald B. Sanberg, Malleable Founders' Society, discussion leader; Hans J. Heine, technical adviser.

Discussions brought out the fact that malleable and pearlitic malleable castings have many excellent properties which recommend them for a wide variety of engineering applications. When these advantages are understood and presented, they provide excellent selling tools.

It also was apparent that more information is needed on a number of properties. The importance of additional basic research to provide these data was indicated.

To one who attended the first marketing conference of the society and sat in on the 10th affair on that subject, the change that has taken place in the industry's attitude toward sales is striking. Those attending the 1959 conference acted like intelligent selling is one of the major functions of each company's operations. The timidity displayed by some who attended the first conference in 1950 has disappeared.

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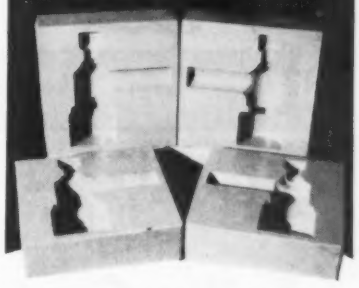

PLASTIC STEEL . . . originally developed for making tools, jigs and fixtures in metalworking plants . . . brought a revolutionary new method to this leading foundry* . . . chopping hours off the time required to produce core boxes, molds, duplicates of wood and metal patterns. Tremendous savings are being shown daily . . . making low cost patterns, repairing and altering patterns, filling large or small blow holes in ferrous and non-ferrous castings, repairing and rebuilding machinery, and many other applications.

PLASTIC STEEL becomes a strong, tough, metallic mass (similar to steel) within 2 hours after addition of the special hardening agent. Once hard, PLASTIC STEEL can be drilled, tapped or sawed with metalworking tools. PLASTIC STEEL is non-shrinking, non-expanding . . . adheres to ferrous and non-ferrous metals, wood, glass and many other surfaces.

* Name on request.

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Prove these figures to yourself. Write for the DEVCON Foundry Bulletin.

Ask for new bulletin describing DEVCON F-2, Liquid Aluminum for making patterns, molds and core boxes.

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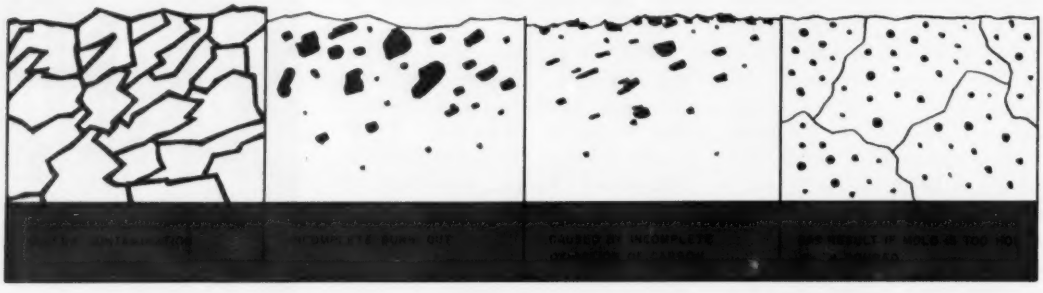
Trouble Shooting

By C. W. AMMEN



Drawings show common types of defects in investment castings and their causes

Sulfur Contamination

Dear Charlie:

We are getting into investment casting along with our sand operation. Recently, we were making a small gear wheel blank in shell, and we moved this job into lost wax to produce it with cast teeth (the teeth were too small for shell). The alloy is a nickel-bearing, copper-base type supplied by the customer, and in shell it worked out fine. In investment, however, we ran into trouble.

The first couple of sets of castings were beautiful; then we got into a mess. We lost approximately 50 per cent of the ductility. Fracture is very poor and looks fuzzy, with thick grain boundaries. The castings look good and are true to size, but the teeth break off in service. We took new metal, went back into shell, and everything was O.K. Then we went back into investment, got good castings for three or four heats, and ran into the same trouble again.

The customer will not change the alloy, for it is made up especially to resist some sort of chemical action by the solution in which the gear must operate.

Sincerely,
Sam

Dear Sam:

Information on defects encountered in investment castings is not nearly as abundant as it will be in time to come. Some valuable information is available from the material suppliers, however, and I suggest that you write to them.

Not knowing what type of investment you are using, I assume it is of the cristobalite type—a gypsum-base binder and blended silicas with the usual modifying agents, widely used for nonferrous work. The loss of ductility in small investment castings is fairly common. An outfit I know of which makes an electronic part in a high-nickel alloy had that problem. Your trouble could have the same source theirs did.

You could be carrying calcium sulfate from improperly cleaned returns (sprues, gates, and bad castings) back into new heats. When the returns are remelted with new alloy, the sulfur is released and contaminates the melt. In some alloys, as little as 0.05 per cent sulfur reduces ductility and produces the thick grain boundaries and fuzziness that you speak about.

The boys with the high-nickel castings found that this was their problem. It was caused by small bits of investment on the returns. Even returns which were thought to be really clean after sand blasting were found to retain calcium sulfate particles.

Subsequently, all sprues and returns after sand blasting were pickled in a 50/50 water and hydrochloric acid solution to dissolve the calcium sulfate. This precaution and a bit of desulfurizing with something like fused sodium carbonate during melting did the trick.

The three big causes of defects in investment castings, aside from design, metal problems, and improper choice of investment material for a given type of alloy, are the following:

1. Improper burn-out programs —not completely oxidizing the carbon residue left by the pattern.
2. Improper metal temperature at the time of casting.
3. Improper mold temperature at the time of casting.

A scaly casting surface which is difficult to remove often is the result of casting into an excessively hot mold. Proper mold and metal temperatures and an effective burnout program for the most part must be worked out in the shop. The investment suppliers' recommendations and directions supplied with

ANNOUNCING NEW HEAVY DUTY 6" AND 8" HICYCLE GRINDERS

Heavy Duty Hicycle Angle Grinder with rotating wheel guard.

Heavy Duty Hicycle Angle Sander with 9" pad.

Model CP-550-SG-4500 Heavy Duty Grinder maintains speed under load, lets the operator really lean into the work.

Here are two *all new* CP heavy duty Hicycle Grinders . . . brutes for power, demons for speed. Hicycle squirrel-cage induction motors running on 180 cycles, 220 volt, 3 phase current provide Built-in Overspeed Protection because maximum speed is always constant, always within safe wheel limits . speed sag under load is less than 15%.

New with these models is the CP *"Tri-Flo" Cooling* System that minimizes "hot spots". This highly efficient system cools motor windings, rotor shaft, main bearings, gear case and switch. Keeps the temperature rise at key points as much as 28° lower than with conventional type cooling.

You get these 7 extra advantages with CP Hicycle Grinders

1–*Hicycle Motor* of advanced squirrel-cage design means no brushes to replace, no armature to burn out. 2–*Power/Weight Ratio* is outstanding because high strength magnesium castings are used for motor, gear case and switch handle. 3–*Oil Sealed Ball Bearings* lubricated for life. 4–*Interchangeable* motors, motor housings, switch handles and switches on all straight and angle models. 5–*Heavy-duty switches* have dust tight seals and phenolic spacers for insulation from motor and to minimize vibration. 6–*Extra heavy micro-mesh gearing* heat-treated for long service. 7–*Guards* fully conforming to A. S. A. safety codes.

Write for complete information on these newest CP Hicycle Heavy Duty Grinders. Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.

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FOR HEAVY MOLDS

Nomad Extra Heavy Duty Track Conveyors, using twin rails, handle loads weighing up to 18,000 lbs. All weights, shapes and sizes of molds can be handled efficiently.

Foundries increase productivity—with reduced manpower—where Nomad Conveyor Systems are used.

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MINIMIZE BURN-OUT...

PSC's All-Sheet Construction Adds to Furnace Tube Life

Experience of users shows much lower frequency of burn-out, with tube life extended up to 100%. In PSC tubes, precision-welded bends are of same metal and thickness as the legs. The continuously smooth walls result in uniform flow of gas, and reduce the carbon build-up and bend burn-out, which commonly result from the rough interiors of cast alloy bends. Lighter than cast by 33 to 50%, PSC radiant tubes cost less initially. Any size, shape or alloy.

Send for Heat-Treat Catalog

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each type of investment should be used as a guide.

Should metal temperature and mold temperature at the time of the cast be too high, the investment will give off gaseous sulfur and cause sulfur contamination of the casting. Coarse grain structure sometimes occurs because the mold is so hot at the time of casting that it promotes very slow solidification. Rough castings are caused when the investment is broken down by too high a calcining temperature. Incomplete burn-out results in water-vapor porosity, carbon pits, and inclusions.

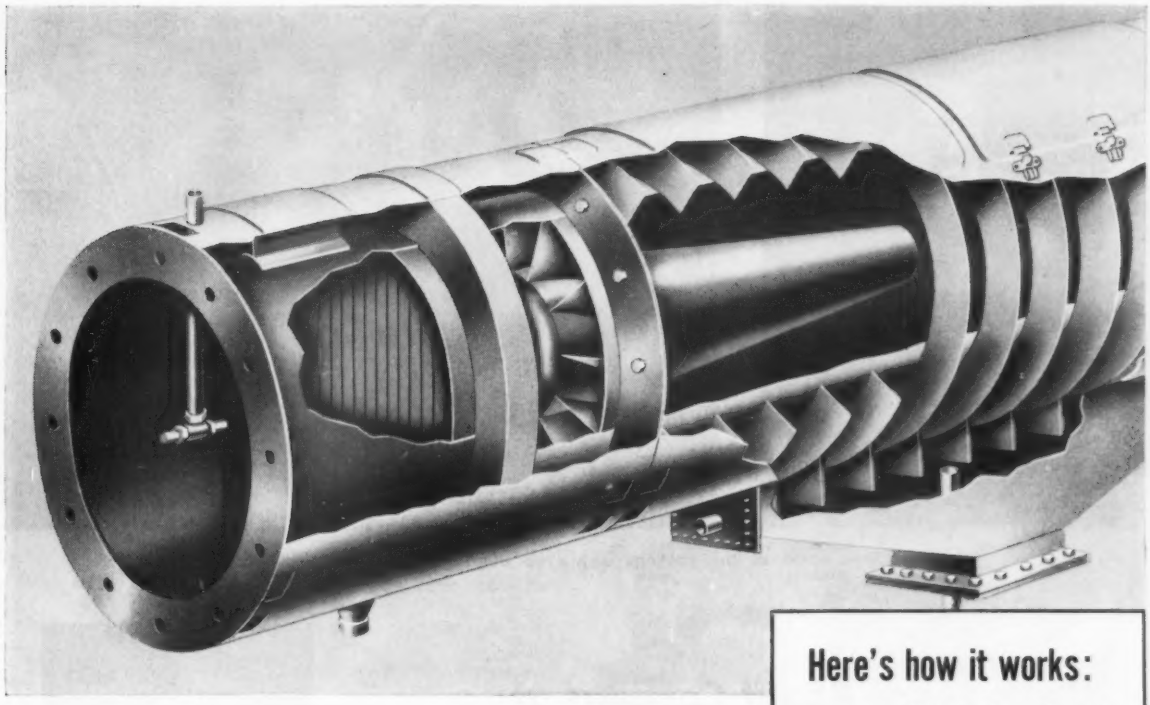
Sincerely,
Charlie

Bearing Aluminum Bars Now Available for Industry

Extensive laboratory tests over a period of several years by Bunting Brass & Bronze Co., Toledo, Ohio, Aluminum Co. of America, Pittsburgh, governmental experimental agencies, and several research institutes have resulted in a new line of bearing aluminum bars for industrial installation and maintenance use.

The new bar is an aluminum-tin alloy with other metals such as copper, nickel and magnesium added to assure finest bearing properties. Distribution will be through Bunting Brass & Bronze Co. Alcoa B-750-T5 is used in production of the bars.

"Better let me walk it off, Charlie. You'll crush the pattern"



Here's how it works:

a spray of liquid enters the collector along with the dust. An impingement screen helps to encase each particle with liquid. Then fixed vanes impart a whirling motion to the wet, dust laden air. Moisture and dust particles are thrown to the sides by centrifugal force and drain into a sump.

The liquid used may be water, oil or solvents, depending on the material being collected.

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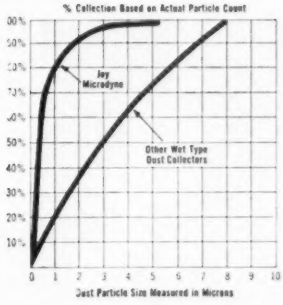
DUST COLLECTOR PACKS MORE EFFICIENCY IN 1/10 THE SPACE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By combining two proved principles of dust collection, the Joy Microdyne collects over 99% by weight of dust particles 5 microns and larger; 92% of 2-micron dust. This means cleaner air.

Because of its unique design the Joy Microdyne is extremely compact . . . 1/10 to 1/20 the size of conventional wet collectors. For example: an 8000 cfm unit is only 26″ in diameter, 130″ long. This means lower initial cost and easier installation . . . in fact, the Joy Microdyne can be installed as part of existing ductwork.

Let us know about your dust collecting problems by describing the type of dust, approximate particle size and cfm required—and write for free bulletin 317-13.

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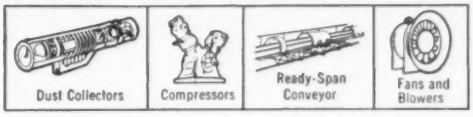

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Engineers view some of the castings displayed during the ICI-ICS West Coast clinic

Users Learn About Castings at

Investment Casting Clinic

By WILLIAM G. GUDE
Managing Editor

● APPROXIMATELY 200 design engineers, metallurgists, purchasing agents, and other representatives of industry have a better understanding of investment castings and how they can be used. These individuals attended the first Investment Casting Clinic, held March 17 in the Civic Auditorium at Santa Monica, Calif.

The clinic, part of a three-day western meeting of the Investment Casting Institute, was sponsored by the institute and the Investment Casters Society. The latter group, founded in 1949 at Los Angeles, is composed of western investment casting producers.

Co-chairmen of the clinic were two ICI directors—Richard E. Gray, vice president, Gray-Syracuse Inc., Manlius, N. Y., and Lawrence R. Schwedes, president, Lawrence Laboratory, Santa Monica, and president of the Investment Casters Society.

Program of the clinic included four workshop sessions. In addition, a large display of thousands of different types and sizes of investment castings was set up in the auditorium, with representatives of producers at hand to answer questions of the visitors.

An opening general session was addressed by Mr. Gray, who explained the basic principles of the investment casting process. Visitors then were divided into four groups for the individual workshops.

The session on design was conducted by G. P. Wilson, president, Humphrey Castings Inc., San Diego, Calif. He presented information on features to be considered when designing for investment castings and ways to obtain the soundest product at least cost.

At the application workshop, directed by Walter Dubovick, president, Engineered Precision Casting Co., Matawan, N. J., participants had an opportunity to discuss investment castings in relation to other metalworking processes. Case studies were described, and the area

Richard E. Gray, co-chairman, addressing the opening session of the clinic

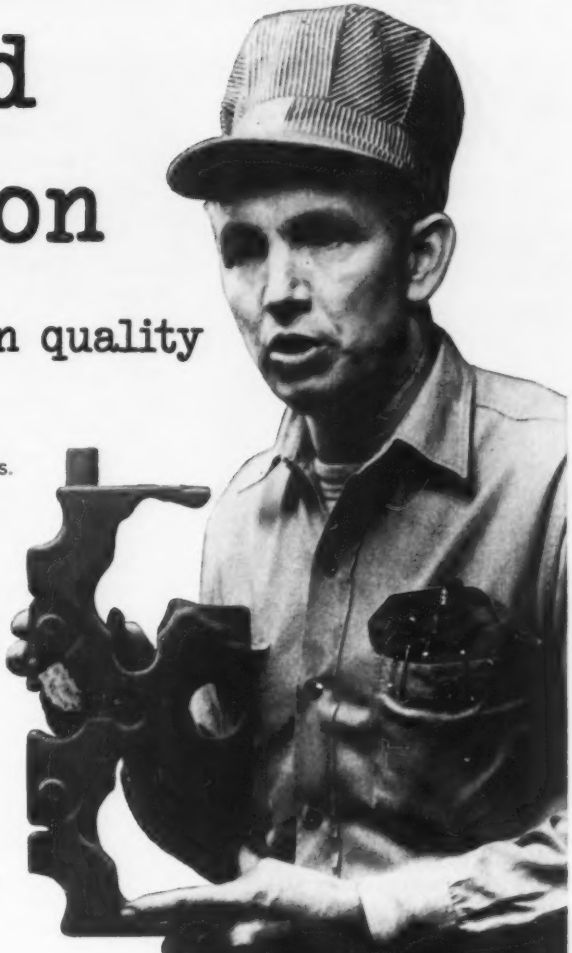
Lawrence R. Schwedes, also a co-chairman, conducted a workshop session concerned with casting specifications

Report from Al Floyd, Assistant Core Superintendent, North Core Room, Golden Foundry Company, Inc., Columbus, Indiana:

We bucked the recession

by holding the line on quality

"The boss, George Stofer, and I talked it over many times. Could we beat the price squeeze by buying cheaper? We decided to stand firm on quality cores. This meant the continued use of high quality **LINOIL.** If we went to a cheap oil for intricate water-jacket cores like these, our scrap would go sky high. We like the added insurance of **LINOIL**... it helps hold our core scrap on heads and jackets to 2.06%. We think that's good! Our customers agree. That's another reason why Golden Foundry poured regularly throughout the slow-down period."



"Using regular lake sand, here's our mixture for these cores.

1% LINOIL
¾% Cereal
2% Iron Oxide
½% Silica
½% GREEN BOND Bentonite
2% Moisture

We bake them at 425° for 2½ hours."

Archer-Daniels-Midland company

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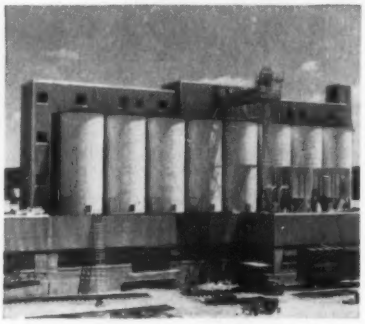
Circle 697 on Page 53

Step-up Storage efficiency, cut Materials losses with Marietta concrete silos



Foundry Core Sand

A Marietta concrete silo system saves you time, money and labor. Any type of mechanical or pneumatic conveyor or filling and discharge method can be used with these silos. Whatever system you choose can be mounted directly, safely on the roof or side wall of a sturdy Marietta silo.

It will pay you to have expert Marietta engineers design the concrete silo storage system that best fits your needs. It's the best way to get the efficient, economical storage you want . . . reduce losses due to materials waste. Our staff will work closely with your consultants, contractors.

Write for your copy of the Marietta Modern Industrial Storage Systems booklet.

Only Marietta offers four types of concrete staves . . . assures you the best construction for your requirements.

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- Charlotte 6, N.C.
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Circle 698 on Page 53

for investment-casting application was analyzed.

The alloys workshop was presided over by R. J. Metzler, sales manager, Wai-Met Alloys Co., Detroit, and F. Kenneth Iverson, Cannon-Muskegon Corp., Muskegon, Mich. They described the wide range of alloys in which investment castings are available, their properties and applications.

Lawrence R. Schwedes conducted the specifications workshop in which he explained how the cost, quality, and dimensions of an investment casting can be affected by what is specified in the drawing of the part to be cast.

At the conclusion of each session, the participants moved on to a different one, thereby covering two in the morning and two in the afternoon.

Second day of the Investment Casting Institute meeting was devoted to committee and directors meetings. ICI President R. R. Miller, president, Precision Metalsmiths Inc., Cleveland, and Lawrence R. Schwedes, program chairman, opened the day-long technical session at Surf Rider Inn, Santa Monica, on March 19. Papers and authors on the program included the following:

"Inspection Techniques of First Articles and Production Parts," by Rudy Iglesias, Convair Div., General Dynamics Corp.

"Evaluation of Investment Castings for High-Temperature Applications," by Earl Campbell, AiResearch Mfg. Co.

"Development of Investment Cast Rifle Chambers," by T. N. Thys, Precision Founders Inc.

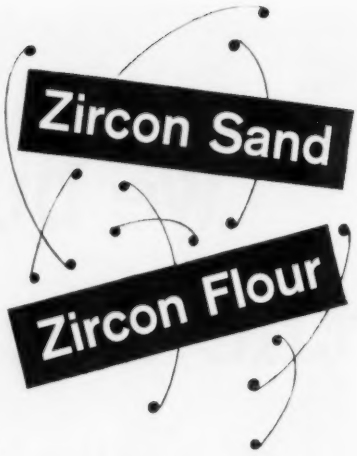
"Presentation of ICI Standards for X-Ray and Zyglo," by E. G. Chapman, Misco Precision Casting Co.

"Investment Casting Technical Research," by F. K. Iverson, Cannon-Muskegon Corp.

"Developments in the Investment Shell," by Ted Operhall, Misco Precision Casting Co.; J. H. Morison, Hitchiner Mfg. Co., and Dr. R. Reuter, National Aluminate Corp.

"Investment Castings in Prototype Development," by A. J. Iler, Northrop Aircraft Inc.

"Investment Casting Metallurgy," by R. F. Waindle, Wai-Met Alloys Co.



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Circle 700 on Page 53

Obituary

William Baud, 44, since 1948 plant superintendent, Mechanical Foundries Div., Food Machinery & Chemical Corp., Los Angeles, died Mar. 17. He joined the company in 1936. Mr. Baud was president of the Southern California Chapter of the American Foundrymen's Society in 1955-56.

William S. Wellman, 84, president, Wellman Products Co., Cleveland, died Mar. 14. Mr. Wellman founded the nonferrous foundry in 1900.

Frank T. Becker, 85, founder and president, Becker Mfg. Co., Two Rivers, Wis., died Mar. 17. He established the gray iron foundry in 1904.

R. A. Bolen, 63, owner of the Bolen Machine Works & Foundry, Grand Junction, Colo., died Feb. 14, in Memphis, Tenn.

Charles B. Johnson, 55, purchasing agent, Chain Belt Co., Milwaukee, died Mar. 30. He joined the company in 1924 as a student engineer, transferred to purchasing and became purchasing agent in 1948.

L. A. Bonner, district sales manager, American Smelting & Refining Co., Philadelphia, died recently.

Walter A. Zeis, president, Walter A. Zeis Foundry Supply & Equipment Co., Webster Groves, Mo., died recently. He had operated his own foundry supply company since 1937. Previously he was with the pattern department of American Steel Foundries, Chicago. He was a past director of the St. Louis Chapter of the American Foundrymen's Society.

Richard E. Hayden, 51, sales manager, Fuel Fired Furnace Div., Hevi-Duty Electric Co., Milwaukee, died Mar. 5. He was sales manager of Industrial Furnace Div., Eclipse Fuel Engineering Co., Rockford, Ill., until it was acquired by Hevi-Duty last year.

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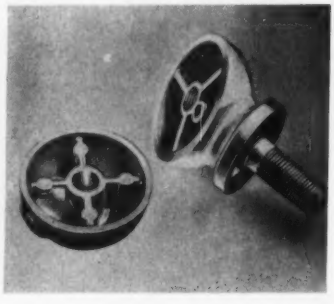
Circle 701 on Page 53

The Shakeout

Resourceful Handling Solves Casting Problem

THE HIGH-STRENGTH antenna base shown here illustrates how proper design and good practice can solve difficult casting problems. Designed for police cars and other automobiles which use large radios or radio-telephones, it is diecast in A380 aluminum by Monarch Aluminum Mfg. Co., Cleveland.



To eliminate a secondary assembly problem, the customer required that the stud be cast as an integral part of the base.

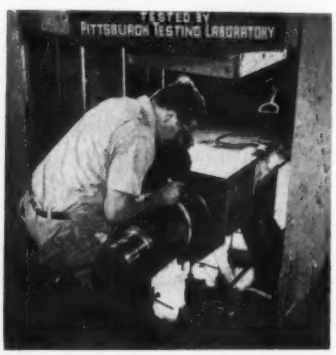
The original problem which had to be solved was that flash in the threads normally would necessitate a removal operation. Effective die design and adroit casting now restrict flash to a negligible amount at the base of the stud, well away from the thread.

A second problem involved devising a method to hold the stud in the correct position to meet dimensional tolerances. This need was met by casting a nonthreaded hole through which a beveled core could position the stud during casting.

For More Details Circle No. 516—Page 53

Strain and Deflection Gages Test Strength

COMPONENT for a Blaw-Knox industrial bucket undergoes strength tests to check design calculations at Pittsburgh Testing Laboratory, Pittsburgh. The test piece is a lever arm barrel for a 2-cu-yd bucket.



In this setup, the barrel is being subjected to high pressures in a 600,000-lb universal testing machine. Electrical strain gages measure the strain at various points along the barrel, and deflection gages under the barrel measure deflection.

The lever arm barrel was stressed to almost 4.6 times its maximum working load before it showed signs of permanent deflection.

For More Details Circle No. 517—Page 53

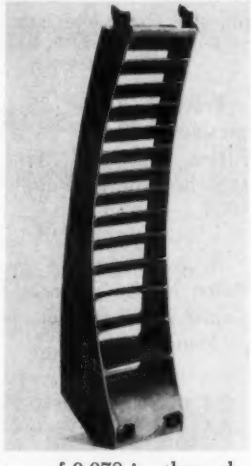
Reference Chart Shows 55 Steel Alloys

REFERENCE CHART which contains 55 of the more widely used cast alloys in the carbon, low alloy, and stainless steel groups has been revised and made available by Lebanon Steel Foundry, 90 Lehman St., Lebanon, Pa. Nickel and Monel also are covered. In addition to such standard data as composition, physicals, etc., the chart includes a new section dealing with design applications for each alloy.

For More Details Circle No. 518—Page 53

Large Parts Are Made by Investment Casting

TECHNIQUES developed by Ferro Cast Div., J. B. Rea Co., Santa Monica, Calif., are said to permit production of large, bulky parts with the same precision and economy associated with investment casting of relatively small parts.

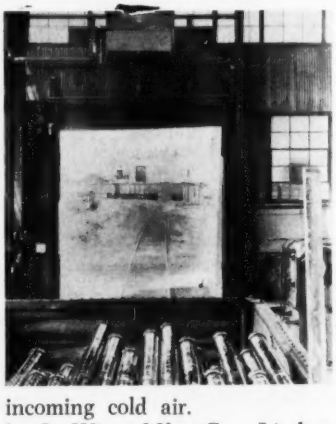


The cascade pictured here is representative of such large parts in production at Ferro Cast. This casting was made for Boeing Airplane Co. as part of the thrust reverser on the 707 jet airliner. It incorporates vane thickness as low as 0.056 in. and sidewall thickness of 0.078 in. throughout 19 in. of over-all length. The casting is produced from a heat-resistant alloy and weighs about 4¾ lb.

For More Details Circle No. 519—Page 53

Overhead Door Heater Cuts Off Cold Blasts

DURING cold weather, frequently opened large doors admit masses of wintry air which cause uncomfortable, hazardous working conditions. Spang-Chalfant Div., National Supply Co., Etna, Pa., solved this problem by mounting an overhead door heater over the freight doors to curtain off incoming cold air.



Manufactured by L. J. Wing Mfg. Co., Linden, N. J., the heater is connected to the door electrically. When the door is opened, the heat goes on automatically and filters warm air through the cold blasts. The heater is thermostatically controlled when the door is shut.

For More Details Circle No. 520—Page 53

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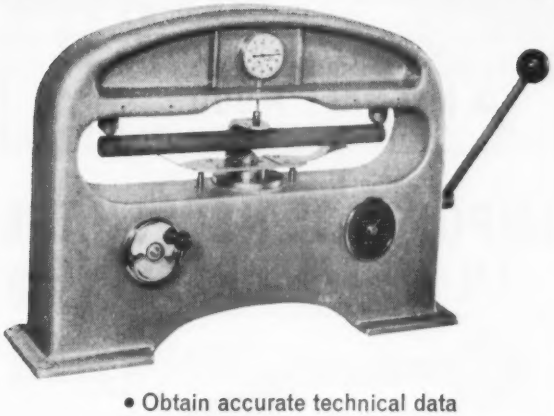

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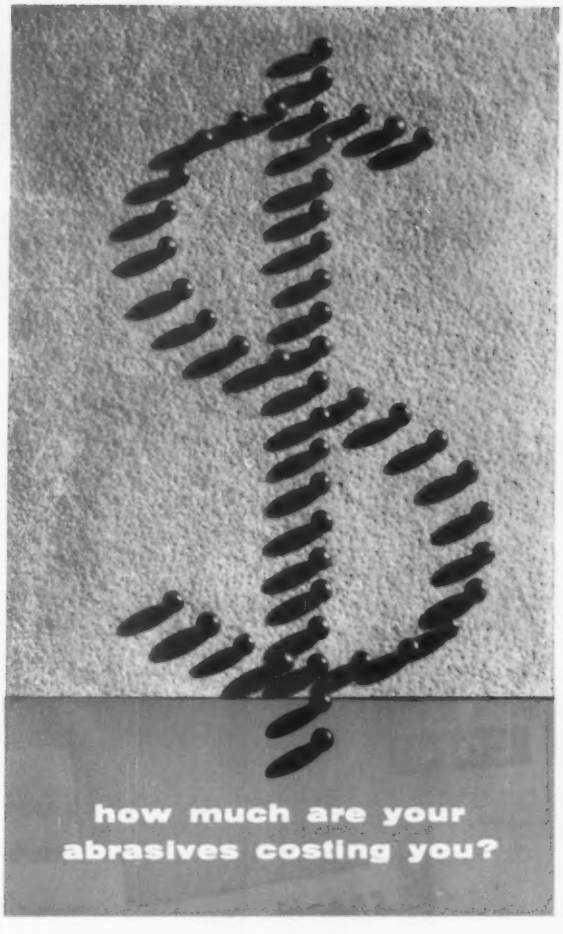

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Circle 702 on Page 53

Circle 703 on Page 53

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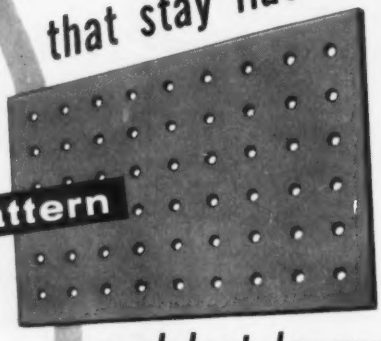

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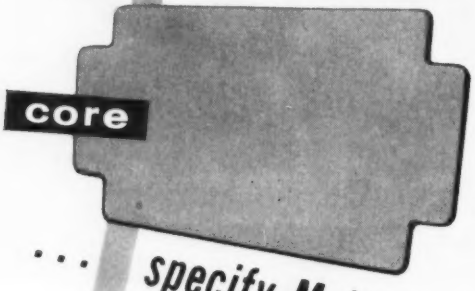

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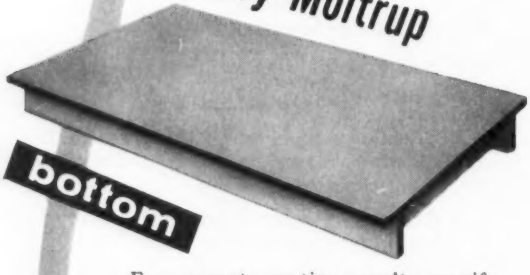

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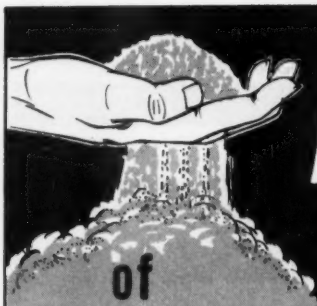

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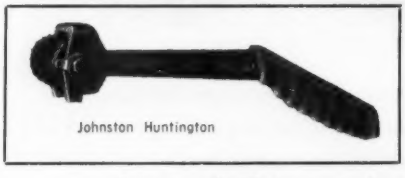

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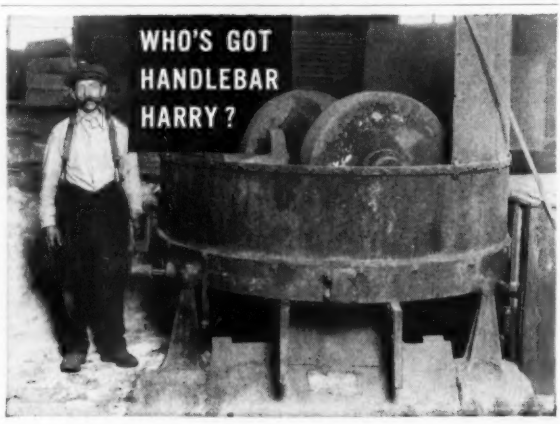

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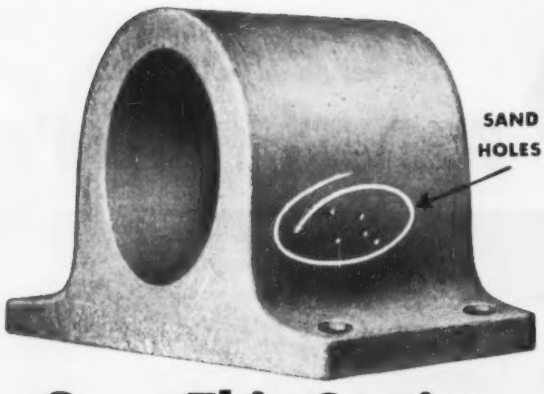

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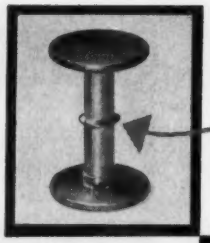

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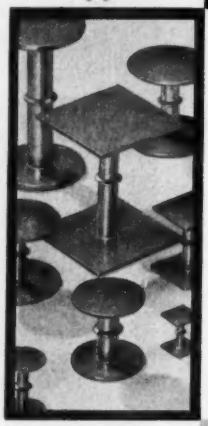

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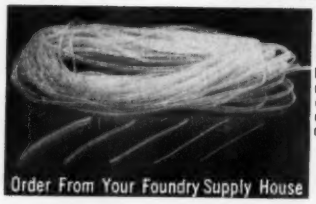

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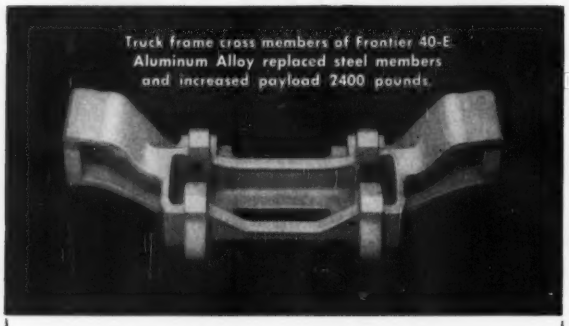

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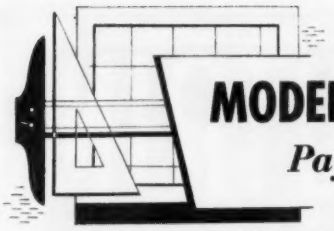

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Circle 717 on Page 53

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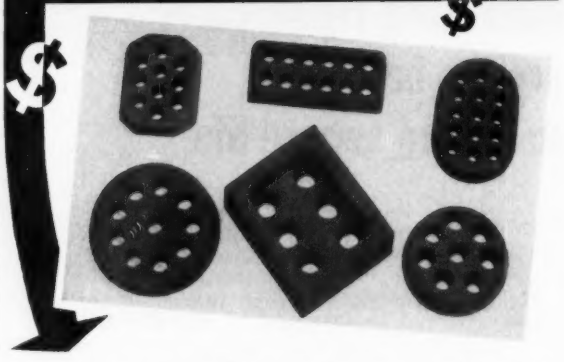


Custom Made • Will Duplicate Your Sample or Drawing • Unlimited Design Range • High Heat Resistance • Extra Hard • Saves Time—Trouble

RUDOW quality Strainer Cores cut rejects, cut costs, keep castings free of oxides, slag and impurities—simplify gaiting control and metal flow, for greater production. We offer you Free Samples of RUDOW Strainer Cores—made like your sample, or from your drawing. Write today—or phone MAin 6-1163.

SEND FOR FREE BULLETINS, PRICES ETC.

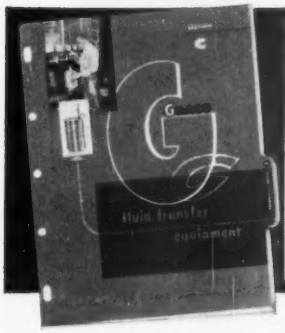
RUDOW MANUFACTURING CO.
2602 Venice Rd. • P. O. Box 2121 • SANDUSKY, OHIO

Circle 718 on Page 53

FREE!

NEW IDEA BOOK

ON PUMPING FLUIDS OF ANY DENSITY



TRANSFER—

- LUBRICANTS
- CHEMICALS
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- ACIDS
- GREASES, ETC.

DIRECT FROM DRUM!

Here's the finest reference in the field! It's packed with pictures, loaded with charts, diagrams, tables of facts and figures. You *need* Graco's new book to learn about Graco's new equipment. Send for your *free* copy today.

GRACO ENGINEERS AND MANUFACTURERS

GRAY COMPANY, INC. • 525 Graco Square • Minneapolis 13, Minn.

(See Phone Book Yellow Pages, Spraying, for Local Graco Suppliers)

Circle 719 on Page 53

STRAIGHTEN, SIZE, COIN

WARPED MALLEABLE IRON CASTINGS

in one operation on the

CECOSTAMP

- **Save in manufacturing costs**
- **Restrike to close tolerances**
- **Reduce number of rejects**
- **Improve inspection methods**

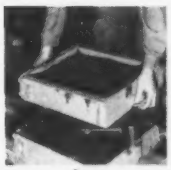
The Cecostamp's impact blow not only straightens, but can also coin to close tolerances • 100% restrike in the Cecostamp makes it unnecessary to inspect and size castings manually, piece by piece • No longer is it necessary to laboriously stack castings in annealing baskets to minimize distortion • In many cases, close tolerance restrike reduces casting weight and minimizes machining operations • The Cecostamp is an air-powered Drop Stamp; rapid, safe, easily operated • Dies are simple, inexpensive • Applications often displace larger, more expensive presses • Write for complete details.

CHAMBERSBURG ENGINEERING CO.

CHAMBERSBURG, PA.

Circle 720 on Page 53

When casting Aluminum



or Magnesium

Improve product and process with B&A® ALKALI FLUOBORATES and Potassium Titanium Fluoride

As a purifying flux in aluminum casting, B&A Potassium Fluoborate removes oxides . . . acts as degassing agent . . . forms a dry dross . . . improves fluidity of the molten metal. Subsequent treatment with B&A Potassium Titanium Fluoride, or a mixture of Potassium Titanium Fluoride with Potassium Fluoborate (for lower melting temperatures), produces better grain structure . . . with increased tensile strength, greater elongation, better machinability, and other benefits stemming from improved grain.

In magnesium casting you can reduce rejects by using the Alkali Fluoborates as oxidation inhibitors with both green sand and core sand. Cores are easier to make. They collapse faster. They're easier to shake out.

Write today on your company letterhead for further information, test samples, technical assistance.

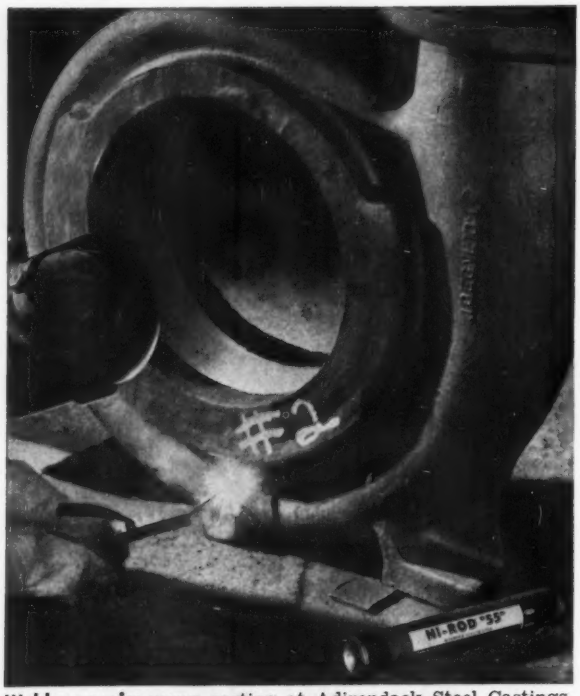
BAKER & ADAMSON® Fine Chemicals

Allied Chemical

GENERAL CHEMICAL DIVISION

40 Rector Street, New York 6, N. Y.

Circle 721 on Page 53



Weldor repairs pump casting at Adirondack Steel Castings, Div. of Consolidated Foundries, Watervliet, N. Y. Time — 2 hours. Material cost — $19.

Foundry gives a new face to scarred castings

This $1000 casting might have been scrapped.

It had four sand inclusions near its base. But a foundry weldor chipped out the defects and filled them with only nine pounds of Ni-Rod "55"* weld metal. All it took was $19 and part of his afternoon to *permanently repair* this 985 pound casting.

It's easy to salvage castings with Ni-Rod "55" Electrodes. Welds are sound and strong, ductile and machinable. And — they neatly match the color of most cast iron.

Rarely is preheat or post heat required.

Easy to handle Ni-Rod "55" electrodes work in all positions. A.C. or D.C., you get a smooth bead and easy slag removal. And — weld ductility resists fusion zone cracking.

"Repair Cast Irons Quickly and Easily" is an Inco booklet that shows how other foundries salvage castings, cut costs with Ni-Rod "55" electrodes. Write for your free copy today.

*Registered Trademark

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street — INCO — New York 5, N. Y.

INCO WELDING PRODUCTS

ELECTRODES • WIRES • FLUXES

Circle 722 on Page 53

EMPIRE*

"THAT GOOD"

FOUNDRY COKE

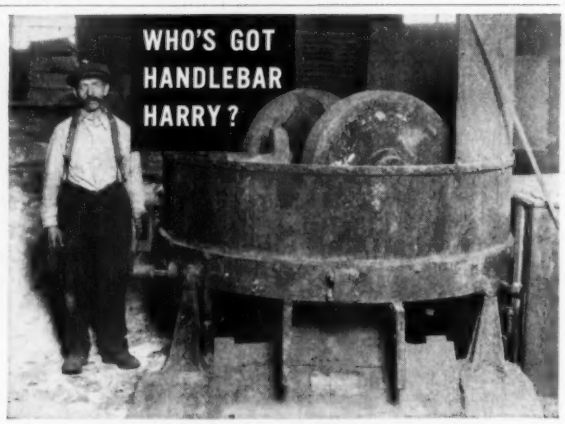
DEBARDELEBEN COAL CORPORATION

2201 First Ave., North • Birmingham 3, Ala.

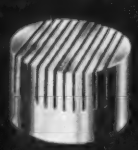
Phone: ALpine 1-9135

*Reg. U.S. Pat. Off.

Circle 723 on Page 53

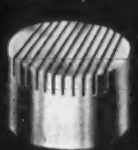


SLOTTED CORE BOX VENTS



X-TRA DEEP HEAD .156 Wide Slots .014

SHALLOW HEAD .031 Wide or Narrow Slots .014 .010



DEEP HEAD .093 Wide or Narrow Slots .014 .010

CO_2 TYPE DEEP HEAD .093 Wide or Narrow .014 Slots .010

INSERTING DRILL

- MOST ECONOMICAL METHOD for INSERTING CORE VENTS
- CORRECT DEPTH
- UNIFORMITY OF HOLES
- FASTER INSERTION OF VENT

VENT CLEANER

- FOR CLEANING SLOTS
- MADE OF TEMPERED STEEL
- EASY TO USE

Manufactured by C.M. SMILLIE & CO. 1124 WOODWARD HGTS., FERNDALE 20, MICH

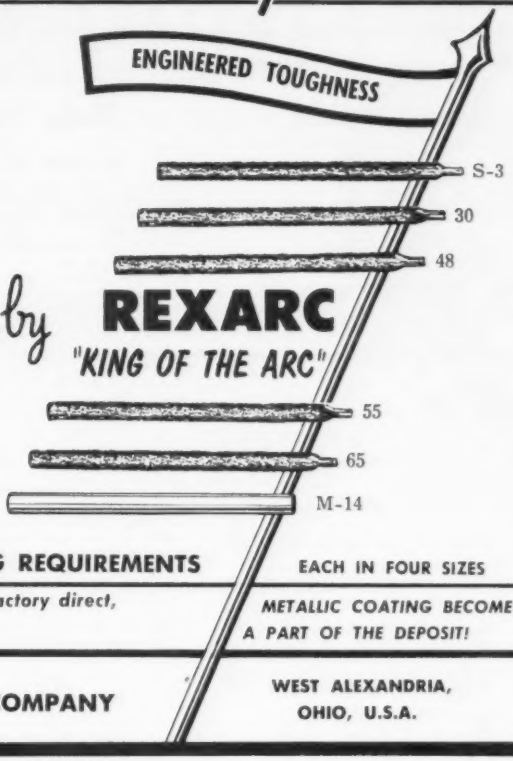
Circle 724 on Page 53

BETTER WELDS | SMOOTHER, EASIER APPLICATIONS | ADDITIONAL SAVINGS | BETTER WEAR RESISTANCE

A royal proclamation by **REXARC**
"KING OF THE ARC"

presenting:

SIX ELECTRODES
TO COVER 95% OR MORE OF
YOUR BUILDUP AND HARD-FACING REQUIREMENTS



EACH IN FOUR SIZES

Contact your nearest distributor, or the factory direct, for free 20-page manual

METALLIC COATING BECOMES A PART OF THE DEPOSIT!

MANUFACTURED BY
The SIGHT FEED GENERATOR COMPANY

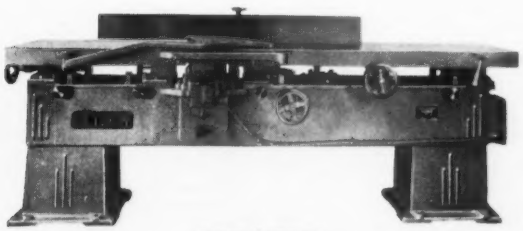
WEST ALEXANDRIA,
OHIO, U.S.A.

Circle 725 on Page 53

"OLIVER" No. 12 Hand Planer and Jointer has tilting front table for planing draft

Front table tilts sideways up to 5 degrees, enabling the pattern maker to obtain the draft on every straight piece of wood that passes through his hand. Available in 20", 24" or 30" width planing capacity. Heavy bed, mounted on two cabinet columns, dissipates all vibration and allows maximum footroom for operator. Send for free folder giving technical details.

OLIVER MACHINERY COMPANY
GRAND RAPIDS 2, MICHIGAN

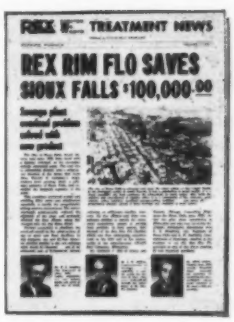


"OLIVER" — famous for Precision Machinery

Circle 726 on Page 53

Find out how others are solving

Industrial Treatment Problems



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City.....*Zone*.....*State*.....

Circle 727 on Page 53

CLASSIFIED ADVERTISING

Help Wanted

SALES MANAGER

For medium size gray iron foundry located in New England. Semi-Captive. Must be able to discuss all phases of gray iron castings and have excellent record in establishing new and volume accounts.

Send complete resume on education and experience together with salary requirements. All inquiries will be held in strict confidence.

BOX 462, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY EXECUTIVE

We are seeking a manager 35 to 50 for our established, small, Midwest investment casting foundry who has a technical background and varied experience in both ferrous and nonferrous investment casting. He must be capable of taking full charge of production, engineering and sales as well as participating in general management of the company.

Vice-Presidency is open to the qualified man. Commensurate salary plus profit participation. Please submit in complete confidence resume of your previous employment, educational and personal background, past earnings and salary requirements.

BOX 451, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY ENGINEER

WANTED: Experienced foundry engineer capable of designing and developing core and pattern equipment for a mechanized gray iron foundry. Experience in basic machining operations and overall methods and process engineering is also required. Prefer graduate engineer with Metallurgical background but practical experience will be favored over theoretical training only. All replies confidential. Address: Box 459, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MOLDING SUPERVISOR

Required by Midwest steel foundry. Must be familiar with mounted squeeze and pin lift work. Supply industrial experience and personal history. Address: Box 467, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLEANING ROOM SUPERINTENDENT

For Midwest steel foundry making miscellaneous castings. An excellent salary awaits a top performer. Provide both industrial and personal history in reply. Address: Box 468, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

FOUNDRY METALLURGIST

Foundry metallurgist with B.S. degree, or equivalent technical knowledge, with experience in ferrous foundry operations. Must be capable of establishing controls for electric furnace melting and supervising metallurgical laboratory.

Desire person who has served apprenticeship in gray iron foundry, with practical knowledge of molding, core making and heat treating. Must be capable of assuming full charge of expanding metallurgical department and interested in attractive, long-term opportunities.

Salary open depending on experience. Fringe benefits above average, with noncontributory surgical, hospitalization and profit sharing program. This is an immediate opening in Hagerstown, Maryland, with no traveling required.

BOX 438, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

OPPORTUNITY

A well established Midwestern (Chicago area) gray iron foundry, capacity 400 to 500 tons per month of castings running from a few pounds to several tons, requires services of a general manager. To qualify he must have a solid practical gray iron foundry background and be able to deal with very substantial customers. We feel that the man we need will take a greater interest if he owns part of the business.

This is an exceptional opportunity to take an active part in the management and acquire an interest in a well established business with an excellent record dating back over 25 years. Investment of $25,000.00 would be preferable. Must furnish references. Replies will be treated very confidentially.

BOX 452, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

PLANT ENGINEERS

Experienced on layout of all types of foundry equipment, material handling and material flows. Send complete details on work history, education and family status. Include recent photograph. All replies confidential.

BOX 419, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

OPPORTUNITY

We want to bring a man into our organization who is in his thirties, has a good background in nonferrous foundry operation or metallurgy, and who has the ability to develop in the management end of the foundry business. Give full resume of experience, salary desired, and recent snapshot, if available. All replies will be held confidential. Location: Central Eastern Seaboard. Address: Box 453, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FLOOR INSPECTOR AND CASTING LAYOUT MAN

Young man 25 to 35 years of age capable of checking patterns, core boxes, and sample castings against blueprints to establish dimensional accuracy. Should be generally familiar with foundry defects, inspection methods, able to prepare reports, and maintain records. Excellent opportunity with well established malleable foundry in midwest. Address: Box 444, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN

Small jobbing foundry in Detroit area requires man to take charge of molding, coremaking, melting and cleaning. Must be thoroughly versed in producing RWMA as well as Bronze and Aluminum alloy sand castings. Send resume of experience, etc. Address: Box 450, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Capable of running aluminum and bronze jobbing foundry—must be willing to work with newest processes—well established company—profit sharing plan. Address: Box 469, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

FOUNDRY DESIGNERS AND DRAFTSMEN

Large manufacturer with a number of gray, nodular, and malleable iron foundries in the Middle West has openings in its central engineering department for draftsmen and designers with experience in the design of foundry facilities, including sand processing and handling systems, molding equipment, cupolas, and other allied equipment and installations. Give detailed resume of experience, age, education, salary requirements, date available, and a recent picture in first letter.

BOX 428, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

CORE ROOM GENERAL FOREMAN
Second Shift

A Wisconsin gray iron foundry producing quality automotive and agricultural castings requires a second shift general foreman for its core room department. Must be able to assume complete responsibility for all core room operations. Cylinder head experience and knowledge of shell mold practices also desirable. Position offers opportunities for further advancement. Fine benefit program, and good living conditions. Please list complete background in first letter including references and salary desired.

BOX 458, FOUNDRY

PENTON BLDG CLEVELAND 13, OHIO

MOLDING SUPERVISOR

Progressive foundryman needed to assume complete responsibility for all molding operations, in Central Ohio firm producing gray iron,, alloys, and ductile iron; minimum of 5 years' experience in supervision. Synthetic sand and incentive shop experience necessary. Castings to 5 tons. Good opportunity. All replies answered and confidential.

BOX 449, FOUNDRY

PENTON BLDG CLEVELAND 13, OHIO

WANTED: FOUNDRY METALLURGIST

Excellent opportunity for a young man with ferrous foundry experience.
Degree in Metallurgy required.

PERSONNEL DEPARTMENT
GUNITE FOUNDRIES CORPORATION
302 PEOPLES AVENUE
ROCKFORD, ILLINOIS
PHONE: WO 4-3301

FOUNDRY FOREMAN

Retired or semi-retired, in good health, interested supplement present income, needed as practical consultant by foundry in Colombia, South America, for period up to one year, possibly longer subject mutual agreement Round trip travel expense paid by company. Write full qualifications and remuneration desired. Address: Box 455, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

STEEL FOUNDRY MOLDING FOREMAN

To take charge of floor molders, rollover machine molders, squeezer molders, pouring crew and labor for molding department. Must have thorough knowledge of loose pattern molding, heading, gating and pouring. Send complete details, experience, health and salary requirement. Address: Box 463, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES ENGINEER

Experienced in steel castings. Chicago and surrounding area. Good opportunity for right person. Address: Box 472, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CORE ROOM FOREMAN

For gray iron jobbing foundry in South Central Michigan. Forward resume. Replies held confidential. Address: Box 448, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

W A N T E D

Experienced cleaning room foreman wanted for gray iron foundry making small castings. Address: Box 446, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Employment Service

FOUNDRY PERSONNEL SPECIALISTS

National Placement and Procurement of

GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS

Confidential Inquiries Invited
From Employers and Qualified Applicants

For Fast Competent Assistance Contact

DRAKE PERSONNEL, INC. **FINANCIAL 6-8700**
JOHN COPE, DIRECTOR **29 E. MADISON ST., CHICAGO 2, ILL.**

Positions Wanted

FOUNDRYMAN
Graduate engineer with sound thorough background in ferrous operations. Age 32. Have supervisory experience in melting, molding, cleaning and quality control. Now employed as sales engineer. Desire to relocate from Middle West to West Coast. Address: Box 482, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT
Technical background, experience in all phases of gray iron production—costs, efficiency and good methods are foremost. Good labor relations and close control of all operations. Address: Box 483, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY ENGINEER
Metallurgical graduate, young, active, seeking position as assistant to superintendent in progressive iron or steel foundry. Experience in basic and acid cupola melting, sand and metal control, modern molding practices. Desire to assume new responsibilities and the chance to broaden experience. Address: Box 435, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR SALES
College graduate under 40 with 15 years in top management. Presently employed as Foundry Superintendent. Will consider position of superintendent, the equivalent, or sales in limited territory. Prefer Midwest. Can furnish best of references for operating in ductile and gray iron. Address: Box 441, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CORE ROOM FOREMAN
Age 48, 19 years' supervision, familiar with all phases core room operations. Now employed on West Coast and would prefer position in same area. Will consider any position that offers opportunity. Address: Box 466, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PLASTER FOUNDRY ENGINEER
Experienced in the different types of foundry techniques of casting nonferrous metals into plaster molds. Also available consultant service in pressure pattern castings, foam rubber molds, tire castings and precision castings. Address: Box 436, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CORE ROOM SUPERVISION
Thirty years in foundry, 20 years' core room supervision, both steel and gray iron, on blowers, bench, rollover and CO_2. Good labor relations. Address: Box 480, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN
Thorough knowledge of all phases of foundry operation. Degree patternmaking apprenticeship. Shell mold pioneer. Experience in foundry research, process engineering. Have been project engineer for consultant. Presently employed. Age 40. Address: Box 465, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER
Progressive foundryman familiar with every phase of practical experience on all classes of work. Now employed. Would like to make change. Address: Box 474, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT
Practical and technical 30 years' experience jobbing and production. Familiar with every phase of the foundry. Now employed. Address: Box 471, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLEANING ROOM FOREMAN
Widely experienced, free to relocate. Address: Box 470, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

ASSISTANT TO PLANT MANAGER
Age 36, desire change for better opportunity. Experience in nonferrous metallurgy, lab supervision, gating, cost control, and all phases of sand and plaster mold foundry operations. Address: Box 442, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLEANING ROOM FOREMAN
20 years practical and technical knowledge of gray iron jobbing work. Best of references as to character and ability. Address: Box 443, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES MANAGER—STEEL CASTINGS
Fifteen years top company. Specialize in Carbon, Low Alloy and Stainless. Presently directing national sales, advertising, sales promotion, engineering. Patents. Foundry manufacturing. Any location. Base $15,000. Complete resume available. Address: Box 440, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

POSITION WANTED
Graduate engineer with seven years in gray iron engineering and supervision wants to relocate West of Mississippi. Good record, good references. Prefer small foundry with opportunity. Address: Box 456, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY ENGINEER OR EXECUTIVE
Age 41, 20 years' experience in gray iron, malleable, brass foundries as an engineer, Superintendent and manager. Familiar with every phase of the foundry. Now employed but location unsatisfactory. Address: Box 476, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN
Gray iron and malleable foundryman with 17 years' supervision experience desires position as foreman or assistant superintendent. Prefer Middle West. Address: Box 457, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES ENGINEER
What do you seek in a FOUNDRY SALES ENGINEER? Technical experience? Sales ability? Good personality? Broad education? I have a fair share of all the above. Please let me show you where I can be of service to your organization. Address: Box 460, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Qualified career foundryman, age 45, with over 20 years of experience at the production and customer levels. Personable, energetic and familiar with processes of low carbon, high alloy and stainless steel. Also familiar with Zyglo and X-ray requirements of castings for services and A.E.C. Address: Box 447, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PERMANENT MOLD ENGINEER
Graduate Metallurgist with 25 years' experience in light metal castings. Handle all phases of engineering or supervise complete operation. Interested in process development. Address: Box 473, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

NONFERROUS FOUNDRY SUPERINTENDENT
Good working knowledge of all phases of nonferrous foundries. Understand gating, sand control in both foundry and core room. Can produce castings for chrome plating. Two and one-half years of metallurgical training. Address: Box 479, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER
Practical, progressive and technically trained foundryman. Well versed in all departments of ferrous jobbing shops, on castings up to 25 tons. Cost and quality minded. Excellent labor relations. Age 46. Now employed. Address: Box 454, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

HAVE YOU EVER NOTICED

the many types of headings under which classified ads are listed? There's one for every want—if you want to obtain qualified personnel, want to sell used machinery, want to buy equipment, or want a better position, you should advertise in the classified section of FOUNDRY.

FOUNDRY has 75,000 readers. They represent readership which covers the entire foundry industry. What does this mean to a classified advertiser? It means that for a nominal sum you get the widest possible coverage of the industry. Your message reaches "the right people".

★

CLASSIFIED ADVERTISING DEPT.
FOUNDRY
CLEVELAND 13, OHIO

Representatives Wanted

AGENTS WANTED

Distributors or Manufacturer's Agents. Several choice territories available to experienced foundry equipment salesmen or agencies interested in selling the world-famous HANSBERG CORE SHOOTER. Hansberg is the most successful coremaking machine of the last ten years and is better than competitively priced. More models than any other manufacturer in this bracket. New bench and floor models include semi- and fully-automatics, combination shooter-gassers, rollover-strippers, vacuum and pressure CO2-gassers.

HANSBERG SHOOTERS, INCORPORATED
P.O. BOX 729
EVANSTON, ILLINOIS

SALES REPRESENTATIVES

Here is an established competitively-priced line you can count on for a good income. Milward Alloys, a leading manufacturer with a strong reputation is now in the process of localizing many sales areas to give better service to customers and prospects from coast to coast. A considerable number of territories are open. We need men who will take them on, full or part time.

You may now be serving the trade or you may have foundry experience. Maybe you're retired with time on your hands. Regardless of your situation, you will be amply rewarded—because Milward's line is broad and in constant demand. Milward alloys cut foundry costs. Orders are promptly filled. That's why we have a substantial reorder business.

The Milward line includes: copper shot; phosphor copper and other powerful deoxidizers and degasifiers; aluminum bronze and manganese bronze hardeners and ingots; copper silicon, copper manganese, copper iron, copper aluminum and copper chrome alloys; nickel copper and nickel iron alloys; aluminum titanium, aluminum silicon, aluminum manganese, aluminum iron and aluminum copper and other alloys.

Phone or send us a letter describing the area or locality you can cover, whether full or part time, and tell us a little about yourself . . . your qualifications, experience, and when available. This may well be the connection you've been waiting for. Write or phone: Mr. David B. Milward, President. Phones: Lockport, N. Y. 4-0435, or Buffalo, N. Y. LUdlow 6425.

MILWARD ALLOYS, INC.
Lockport, N. Y.

EXCELLENT OPPORTUNITY FOR RETIRED FOUNDRYMEN

Well established export and import corporation in the field of metallurgical products is looking for district representatives for the sale of special high quality imported Pig Iron. Answers to be kept confidential.

BOX 464, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

WANTED

Sales Representative for Western section of Pennsylvania. Experienced in handling complete line of foundry supplies and equipment. Forward complete resume of experiences including salary requirements.
All replies held confidential.

BOX 434, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

MANUFACTURERS' REPRESENTATIVES

A completely modern electric furnace foundry specializing in shell molding of high strength alloy iron castings and brass castings, desires to appoint manufacturers' representatives in Midwest and Middle Atlantic States. Foundry can meet exacting specifications for physical properties, chemical analysis and microstructure. Men now calling on industrial accounts who require good production quantities of small castings are urged to write. List all qualifications, experience, current principals, etc. No objection to other non-conflicting foundry lines. Address: Box 431, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

TECHNICAL SALES REPRESENTATIVES

Should currently be selling to the foundry industry and be completely familiar with all methods of foundry operation. Background in steel casting technology preferred. Product is non-competitive. Several territories available. Please quote current representation and background. Address: Box 475, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundry Consultants

HEVERLE & HAY
ENGINEERING—ACCOUNTING
CONSULTANTS TO INDUSTRY
(Since 1907)
COST CONTROL—COST REDUCTION
FOUNDRY METHODS
121 NORTH BROAD STREET
PHILADELPHIA, PA.

FOUNDRY CONSULTANT—NONFERROUS

Sand — permanent mold — centrifugal permanent mold — and centrifuge permanent mold. High pressure castings a specialty. Address: ED JENKINS, 253—8th STREET, WEST PALM BEACH, FLORIDA, PHONE: TEMPLE 2-8685.

Opportunity

PERMANENT MOLD METHOD AVAILABLE
THE WAGNER PERMANENT MOLD CO., 2910 Empire Ave., Burbank, California, has developed a Permanent Mold Method for ferrous and nonferrous metals and invites inquiries from any country regarding this method and process.

Open Capacity

NOTICE

Have extra fine-grinding capacity and will custom grind ores such as Iron, Manganese, Chrome, Zirconium, etc. to buyer's specifications.

Prefer inquiries for carload shipments.

UNION MINING COMPANY
2306 FIRST NATIONAL BANK BLDG.
PITTSBURGH 22, PA.

Foundries For Sale

BUSINESS OPPORTUNITIES

Complete mechanized gray - iron foundry available. Ideal labor market. Will supply financial assistance.

BIDDEFORD-SACO DEVELOPMENT COMMITTEE
C/O FIRST NATIONAL BANK
208 MAIN STREET
BIDDEFORD, MAINE

FOR SALE, LEASE, OR JOINT VENTURE

Malleable or gray modern mechanized foundry located on Seaport, Great Lakes Area. Production small castings. Additional 35 ton cupola for floor work.

BOX 439, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY FOR SALE

Gray iron, 6,000 sq. ft. and office. Located in Merrill, Wisconsin. 10 ton capacity, fully equipped, good labor. Sacrifice price. An unusual opportunity. Address: BARCLAY FOUNDRY, INC., 4239 W. LINCOLN AVE., MILWAUKEE 46, WISCONSIN.

Foundries Wanted

FOUNDRIES • WANTED • EQUIPMENT
FERROUS—NONFERROUS

Production — Jobbing — Captive — Nationwide foundry investment organization expanding. Complete foundry with or without property will be considered. All replies confidential. PRINCIPALS ONLY.

BOX 396, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

ALUMINUM FOUNDRY WANTED

Making die or sand castings and located in Indiana or Ohio. Must have going volume of business with reliable customers. Address: Box 478, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Wanted-To-Buy

EQUIPMENT WANTED

Mullers, cut-off saw, dust collector, grinders, molding machines and miscellaneous equipment suitable for use in a nonferrous operation. Kindly send lists stating condition and prices to:

CUSTOM CASTINGS CORP.
BOX 395
WEST WARREN, MASS.

WANT TO BUY

Osborn 276J or PJ
Osborn Rotalift
B & P or Simpson portable muller

BOX 437, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

WANTED

Used or broken Silicon Carbide Grinding Wheels of any kind or size, regardless of bond. Will pay $35.00 per ton.

UNION MINING COMPANY
2306 FIRST NATIONAL BANK BLDG.
PITTSBURGH 22, PENNSYLVANIA

MIXER WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address: Box 578, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED TO BUY

Two (2) Mold Machines—Davenport make, 40 AJS Jolt Pin Lift. Address: Box 481, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED

Osborn Model 716PJ Molding Machines. Must be in good condition. Address: Box 429, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

For Sale

FOR SALE

GRAVITY ROLL (heavy duty) 15" and 30" wide rollers, 4" centers, 2¼" Dia.—above rail
CHICOPEE CHIEFTAIN Shell Core Blower (1955 Model)
FREMONT FLASKS (Many sizes to choose from) Also Jackets
SPO #2136 Jolt Squeeze Pin-Lift
SAND STORAGE BIN (50-ton capacity)
MOULDERS' FRIEND (50" Brush with extra brush) 15 HP Motor
HOUGH PAYLOADER ⅛ Yard-Model HA
SKIP-HOIST CHARGER for 30-36 Inch Cupola
P & H Outside Cab-Controlled 5-ton, 115 volt DC Fast Crane, 37 ft. 2 inch Span (Excellent Buy)
CHAINOMATIC (Christian - Becker) balance 1/20th MG—Reworked by factory trained mechanic
Other good equipment—Send us your inquiries.

W. O. MC MAHON
BOX 5799, HOMEWOOD STATION
BIRMINGHAM 9, ALABAMA
PHONES: TRemont 1-2088 or TRemont 9-6170

For Sale

SAND BLAST EQUIPMENT
SELL-BUY-TRADE
GUARANTEED MACHINES
TERMS: 3 YEARS TO PAY

$70,000 werth new Pangborn and Wheelabrator parts. Priced 25% less than list.

6' LF-14 Pangborn Table	$2200.00
9' LG-14 Pangborn Table	4500.00
6' LG-14 Pangborn Table	2500.00
4' LF—Pangborn Table	2500.00
Pangborn 14 GK Barrel	2500.00
Pangborn 8 x 8 Room	2800.00
Pangborn 53 EN2 Hand cabinet	325.00
Pangborn Auto Peening cabinet	1100.00
48 x 48 Wheelabrator Tum. w/loader	4500.00
42 x 48 Wheelabrator Tum. w/loader	2500.00
27 x 36 Wheelabrator Tum. w/loader	3000.00
15 x 20 Wheelabrator	1800.00
8' Wheelabrator Table Blast	2000.00
4' Wheelabrator Table Blast	2500.00
72" American Table Room	4800.00
14 LG5 Pangborn Rotoblast Multi-table 4/5—5' tables	9000.00
Pressure Tanks, all types	150.00 up
Vapor Blast cabinets	400.00

All types and sizes of Hand Cabinets, Dust Collectors, Pressure tanks, Rooms, Horizontal or vertical Tumbling Barrels and additional Sand Blast Equipment too numerous to mention.

DIAMOND SALES, INC.
5654 W. Jefferson
Detroit 9, Michigan
VI-3-6750

FOR SALE

Robins Floatex SSC Unit 5' x 6' 12,000# cap. New 1951

Hough HA Payloader, 1951. Rebuilt engine, pneumatic tires

Bondactor Gun, model 1000, complete with straight & rt. angle nozzles. New 1950

Jeffrey Vibrating Feeder 10' x 12' with 2.5 KW power supply, new 1950

Yale & Towne 3 Ton "Cable King" Hoist with pendant & trolley

Cleveland Tramrail Hoist (LoHed) 2 Ton cap.

Link Belt Steel Apron Conveyor 20' x 24' with Link Belt Speed Reducer & 5 HP TC motor for use under sand bin.

Chaplets, 4000# tinned steel, purchased from iron foundry that ceased operations, selling at 30% of list, min. order 100#

MEECH FOUNDRY, INC.
9906 MEECH AVENUE
CLEVELAND 5, OHIO
MICHIGAN 1-5550

FOR SALE

1—Pittsburgh Lectromelt furnace size "OT" 15 ton top charge, 4,000 KVA transformer and auxiliary equipment. Address: Box 477, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

For Sale

REPAIR AND REBUILDING SERVICE ON ALL PNEUMATIC TOOLS

We try to carry a complete line of "Hard Chrome Rebuilt Tools" at about half the cost of new tools. Before you discard your old tools, why not send them to us for our estimate on the cost of renewing them with our Hard Chrome Process?

CENTRAL PNEUMATIC SERVICE COMPANY
512 LINDEN AVENUE
DAYTON 3, OHIO

FOR SALE

Pangborn Rotoblast Type ES-192, designed for cleaning of bath tubs. Unit complete with Schneible Collector, 825 gallon skim tank—two pumps. Blast cabinet 45' 6" x 11' 6". Seven rotors with 20 HP motors, 36 hooks on trolley conveyor—2 grit elevators, 6 separators. Spare parts inventory included. Unit offered on, as is—where is basis.

RHEEM-RICHMOND PLUMBING FIXTURES
DIV. RHEEM MANUFACTURING COMPANY
P. O. BOX 111
METUCHEN, NEW JERSEY

Attention: Purchasing Department

FOR SALE

1—#3 National Engineering Straight Lift Bucket Loader—35 cu. ft. capacity. Will lift and discharge 25 ft.

THE ANDREW TERRY COMPANY
TERRYVILLE, CONNECTICUT

CENTRIFUGAL INDUCTION MELTER

ECCO 16 KVA induction furnace, multi-gap type, complete with linked centrifugal casting machine. Semi-automatic operation. All equipment recently over-hauled. Located Midwest. Asking $2500.00. Address: Box 461, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

For Sale

FOR SALE

Fisher Furnaces #600 MNP
Fisher Furnaces #400 MNP
Campbell-Hausfeld Tilt Furnaces
Campbell-Hausfeld Stationary Furnaces
Stedman Core Crusher, Hammer Mill
Skip Hoist for 9½ Foot Cupola—complete
Osborn #405 Rollovers
Mold conveyor 268' long
Elevators
Belt Conveyors
Shakeouts
International Rollover RES
Milwaukee 163 Jolt Stripper
Champion J8L 12 Pin Lift, jolt
Osborn 710J, Pin Lift
Osborn 212J, Jolt Squeezers
Osborn 275J, Jolt Squeezers
Osborn 276J, Jolt Squeeze
International LSJ, Jolt Squeeze
International PJS, Jolt Squeeze
Milwaukee 104 Jolt Squeezers
Champion JS 108 Jolt Squeeze
Arcade 100S Jolt Squeeze
Spo 110 Jolt Squeeze
International Rollover 2410 G portable
International Rollover 30 x 8 no jolt
J & J 610 rollover portable
International pin lifts
Davenport pin lifts
Osborn 559 pin lifts
Spo 506 jolt rollover, pin lift, draw
International Type R core rollover, hand
Swing Grinders
Royer sand preparators
B & P preparators
Blystone sand mixers
American Sand Cutters, Models M, AM, AA
Coleman core ovens
Grinders ½ hp to 25 hp
Disc grinders
Ladles from 50 to 10,000 lb.
Pouring Devices 500 lb. to 2000 lb.
Gyratory riddles
Monorail and bridges
Air Hoists 250 lb. to 10,000 lb.
Overhead chain conveyor #458, track, drives
Blowers-Centrifugal-positive-exhaust
Dust collectors all sizes

FLASKS
ALUMINUM
SLIP and POP
Sizes from 10" x 10" to 48" x 48"

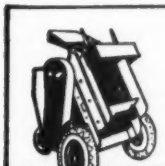
JACKETS
Aluminum and Iron

STEEL FLASKS
Sizes from 10" x 15" to 9' x 9'

CORE PLATES
Transite——Iron——Aluminum

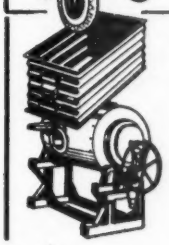
MANY OTHER ITEMS IN STOCK
SEND US YOUR INQUIRIES
WE BUY—SELL—TRADE

THE HOMAN MACHINERY CO.
710 E. FRONT ST. MAIN 10339
CINCINNATI 2, OHIO



EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

14919 SARANAC ROAD — CLEVELAND 10, OHIO



DUST COLLECTOR
1—Whiting Hydro-Clone, wet type, 4,000 c.f.m.

WHEELABRATORS
1—20" x 27", 2 cu. ft. Tumblast
1—36" x 42", 11½ cu. ft. Tumblast, w/loader
1—18 cu. ft. Pangborn Blastmaster

MAGNESIUM CLEANING CABINETS
6—90" x 100" x 65" with exhausters, 8000 c.f.m.

MOLDING MACHINES
1—Rotalifts, 3160
2—TDA4 Taccones

SAND SLINGERS
1—B-P Riddle type, 19" head, 4" tip
1—B-P Motive Jr., 19" head, 4" tip
1—B & P Dbl. Belt type, 19" head, 4" tip

SWING GRINDERS
10—10 H.P. Mummert-Dixon Model 1814
3—25 H.P. Safety Grinding Wheel Model 204

ELECTRIC FURNACE
1—350 lbs. Detroit Rocking

ASK FOR OUR COMPLETE LISTING — GLENVILLE 1-1222

For Sale

FOR SALE

Electric oven for core drying or aging, never used, dismantled and ready for shipping. Complete, 10′ x 10′ x 19′ inside dimensions, 550 degrees.

also

One Sullivan Air Compressor—WJ 3, takes 100 HP Motor, good condition. No motor.

EMGEE SALES
7329 SCOTTWOOD AVENUE
CINCINNATI, OHIO
POpular 1-8483

FOR SALE

1—Morris Cupola, size #9 with jib hoist and mixing ladle. Bucket-charged with two buckets complete with steel and metal building and jib crane. Also 1—blower for above, make "Sutorbilt Corp." 758P-M-24662, complete with Gardner-Denver air compressor and 75 HP General Electric motor and Fox air weight control and windbox Gardner-Denver air compressor for Foxboro. Good condition. Used for one year. Also, 2000 ft. of American Monorail and switches. Address: JOHN B. LAGARDE, INC., BOX 389, ANNISTON, ALABAMA.

FOR SALE

1—6 ft. Type LG-14 Pangborn Rotoblast Table, complete with assortment of spare parts. Good operating condition. Write or Call: MC MINNVILLE CASTINGS CO., MC MINNVILLE, TENNESSEE, PHONE 2168.

FOR SALE

1—Reddy Sandy machine made by Newaygo Engineering Company; in good operating condition. Price $300.00. Address: FLOOD CITY BRASS & ELECTRIC CO., MESSENGER & ELDER STREETS, JOHNSTOWN, PA.

FOR SALE

2 and 4 inch soil pipe patterns and equipment. Will sell or lease gray iron foundry. Address: Box 445, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

For Sale

FOR SALE

MOTORS—GENERATORS
TRANSFORMERS

Unused—Rebuilt

WORLD'S LARGEST INVENTORY

ELECTRIC EQUIPMENT COMPANY
Phone station Collect GLenwood 3-6783
P. O. Box 51 — Rochester 1, New York

FOR SALE

DETROIT ROCKING FURNACE

Type AA with cylindrical shell, 1200 lb. cold or 2600 lb. hot metal, complete with mechanical and electrical equipment, oil filled Kuhlman transformer, 11,000 volts primary, 125 volts secondary, 2800 amperes full load, installation drawings, unused and crated ten years. Ideal for alloy irons, brass or bronze. Price f.o.b. local cars $6,500.00. Address: HOPE ELECTRICAL PRODUCTS CO., 39 LONG AVENUE, HILLSIDE, N. J., ELIZABETH 4-7837.

FOR SALE

Milwaukee 193-28B Jolt, Squeeze, Strip Molding Machine, Serial #16325. 19″ Squeeze cylinder, 20,000# squeeze at 80 P.S.I., 8″ jolt cylinder, 1500# jolt at 80 P.S.I., 8″ draw max. Good condition. Purchased new 1955. $2500.00 F.O.B. Brillion. Address: BRILLION IRON WORKS, INC., BRILLION, WISCONSIN.

FOR SALE

1—32″ x 48″ (13″ Cylinder) heavy duty Herman Molding Machine. Wear Plate Impact Bumper Type, Capacity 4000 lbs. Rollover Serial No. 1087, Bumper Serial No. 3136. Address: GLAMORGAN PIPE AND FOUNDRY CO., P.O. DRAWER 740, LYNCHBURG, VIRGINIA.

FURNACES FOR SALE

Ten used heat treating furnaces and two 7-ton gantry cranes. Good condition, priced to sell. Address: BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.

For Sale

FOR SALE

1—Dextrex Degreaser with temperature controls, steam pressure regulator, 2 baskets, size 70″ x 25″ x 12″. Purchased 1955, slightly used. Price $1200 total.
1—Rotary Lift Hoist, Model F5L2, purchased 1955, never used. Price $900.
1—PRE2 Ingersoll-Rand Air Compressor, 24 x 12½ x 14 stroke, 210 HP, 440 volt synchronous motor complete with exciter, Serial No. 40569-40570.
1—Type 10 Ingersoll-Rand Air Compressor, 17 x 10½ x 14 stroke, 150 HP, 440 volt belt driven motor, complete with reduce voltage compensator, Serial No. 36266-36265.
1—Type #25 Size 8000 CFH DX Surface Combustion Gas Generator purchased new in 1956. Price $5600.
1—Type 44 Continuous Pangborn Shot Blast Machine.

ALBION MALLEABLE IRON COMPANY
ALBION, MICHIGAN

FOR SALE

1—Simpson #0 Muller—Style M (never used).
1—Lancaster Stainless Steel Counter - Current Batch Mixer, Type LW-62.
1—Lancaster Mixer, Model EBG-4.
1—Lancaster Mixer, Model EAG-3.
1—Ingersoll Rand Air Compressor, Type PRE-2. 24″ x 16″, 100# pressure with 300 HP motor.
3—Link Belt Roto - Louver Rotary Dryers, Models, 207-10; 310-16 and 502-20.

R. GELB & SONS, INC.
U. S. HIGHWAY 22, RAHWAY VALLEY R.R.
UNION, NEW JERSEY

FOR SALE

Newaygo twin hopper Handy Sandy, Model HS 7-GT. Guarantee nearly new condition. $1500 less than cost. Also 2,000 lb. Hydroscale; Sermax cupola blower, 3250 CFM, 21 oz.; Two Fisher 16 oz. blowers, 170 CFM and 340 CFM; Wonder paddle core-sand mixer—2½ cu. ft. Address: BARCLAY FOUNDRY, INC., 4239 W. LINCOLN AVE., MILWAUKEE 46, WISCONSIN.

Now Liquidating

OLIVER CORPORATION'S Gray Iron and Malleable Foundries at 533 S. Chapin St., South Bend, Indiana. LATE TYPE Foundry Equipment.

FOUNDRY

4—B&P #80 Mullers
1—P K Single Stage Mix Muller
4—Molders Hoppers Lines
75—Molders hoppers 35 cu. ft.
7—42″ "No Leak" Steel Apron Conveyors
15—Belt Conveyors, flat trough, and magnetic pulley types.
2—Revivifiers & Sand Screens
2—Royer NB2—Royer NRS
1—B & P Screenarator—Large
3—Overhead Sand Bins, 2,000 to 4,000 cu. ft.
9—Shakeouts 5′ x 10′ to 30″ x 40″
5—Oscillating Pan Conveyors
3—Bucket Elevators—51′—60′ centers
90—MOLDING MACHINES—SPO 2192R, 2148—2136—214—113—110's Milwaukee 214 & 244's
OSBORN 276—275
SPO 507 Rollover-413D; Champion Pin Lifts AL2428
6000′—ROLLER CONVEYOR—14″—26″

CLEANING ROOM

Gardner 72″ Horizontal Disc Grinder
WHEELABRATORS — 2 — 48″ x 48″—2—48″ x 42″
TUMBLING BARRELS Whiting 30″ x 48″
GRINDERS HISEY WOLF 24″—20″—18″ wheels
Dust Collectors—Rotoclones, Bag-type Collectors, Whiting Hydroclone

CORE ROOM

Demmler 4EO, 3EO, 2EO, 2K—#2—#55—#50
Champion—CB5—CB15—CB18
Redford Bench type, International SB 13
Coleman Car type Ovens—Young Bros. Continuous
Core Rack, Coreplates, Core Buggies

MELTING DEPARTMENT

3—Whiting #7 Cupolas
1—Whiting #6 Cupola
2—Whiting Allis Chalmers Cupola Blowers, 5800 cfm 20 oz
2—Whiting 30A Coal Pulverizers
2—Whiting 18″ x 36″ U Ladles

Weigh Hoppers, scrap scales, scrap and coke storage bins, Canton scrap shear, Whiting Slag disposal units, 36 Modern pouring devices.

WRITE • WIRE • PHONE

ACME EQUIPMENT CO., INC.

LIQUIDATION OFFICE: Phone Atlantic 9-9263 533 S. Chapin St. P. O. Box 486 • South Bend, Indiana
Chicago Office & Warehouses • 126 S. Clinton St., Chicago 6, Illinois • ANdover 3-3430

AAA Brings You Another "BLUE CHIP" Foundry Liquidation

COMPLETE MODERN GRAY IRON FOUNDRY, MACHINE SHOP, HEAT TREAT DEPT., FORGE, PATTERN SHOP & MATERIAL HANDLING EQUIPMENT

on the premises of the

SACO-LOWELL SHOPS INC.

P. O. BOX 465 — BIDDEFORD, MAINE

AIR COMPRESSORS
1—SULLIVAN Model WG-9, Size 8 x 7, Vertical, w/40 HP Motor, w/After-cooler & Tank.

AIR & ELECTRIC HOISTS
1—I&R Size D-6, 6000# Air Hoist.
8—SHEPARD NILES Electric Hoists, 2-ton cap., Class A-4, 4 HP Motor.
2—KELLER Air Hoists, ½-ton cap.
8—Y-T Chain Hoist, ½ to 3-ton.

BUCKET ELEVATORS
1—NATIONAL ENG. CO. 59' 2" Tandem, 36" Belt, 2 rows 16 x 8" Buckets, Casing size 45" x 55".
1—NATIONAL ENG. CO. 60' Centers, 16 x 8" Buckets, 18" Belt.

BELT CONVEYORS
15—NATIONAL & LINK BELT flat & troughing type, some w/plow-off stations, some w/magnetic pulleys, various lengths & widths from 24" x 20' to 24" x 160'. All sizes.

CRANES & RUNWAYS
1—ELECTRO-LIFT 6-ton, 30' span.
1—SONDER 5-ton cap. Cab operated, 30' span.
1—CHESAPEAKE 5-ton cap. Cab operated, 45' span, Double Girder, w/70' runway.
5—SHEPARD NILES 2-ton cap. 20' span
2000' CLEVELAND TRAMRAIL 3" high T-rail, w/hangers, curves, switches etc.

CUPOLAS & EQUIPMENT
2—SLY 82" dia. Cupolas, 80' high.
1—ROOTS-CONNERSVILLE Cupola Blower, Positive, size 22 x 66", w/50 HP
1—ATLAS Charging Scale Car, 7' W x 8'6" L, w/Fairbanks Morse Scale, 12,250# cap. Platform 5 x 9'.
6—WHITING Charging Buckets 44" x 37"
1—SHEPARD 3-ton Charging Crane, Underslung, Cab operated.
1—AMERICAN Slag Quenching Tank, w/Chain Elevator, 16 x 7" Buckets.

DUST COLLECTORS
1—AAF Rotoclone, Type W, Size 24, Arrangement C, w/40 HP Motor.
2—AAF Rotoclones, Type N, Size 12, Class 750, w/Sludge Ejectors.
4—TORITT #81 Dust Collectors.

GRINDERS
3—BRIDEPORT Model 162 Double End Snagging, 3-speeds, 24 & 30" Wheel.

HEAT TREAT FURNACES
2—G. E. Pusher Type Cast Iron Annealing Furnaces for 30-ton cap. for 24 hrs., width 50", Heating Chamber 16'4" & a Cooling Chamber of 34', door 11½" high. Rating 238 KW for heating cast iron parts 1500° F. & for cooling below 500° F. Max. temp. 1750° F., w/G.E. Atmosphere Gas Converters, rated 1500 CFH.

3—CHICAGO Flexible Shaft Gas Salt Bath 18 x 30 x 18" deep, 800° F.
2—STEWART INDUSTRIAL FURNACES 43 x 53" O.D. Tank 20 x 30", Gas.

HOPPERS & STORAGE BINS
1—NATIONAL 200-ton cap. 18' l x 15' h x 12' w w/4-batch Hopper, 2-compartment.
32—NATIONAL ENG. 1½ ton cap. Moulders Hoppers, w/Undercut Gates.

LADLES & POURING DEVICES
15—WHITING & MODERN, 1500 to 6000# cap. enclosed gear.
6—MODERN F-9 & FA-9 Pouring Devices.

MACHINE TOOLS
1—AMERICAN TOOL WKS. 3½ x 9" Column Radial Drill, Triple Purpose.
1—ARMSTRONG "Marvel" Power Hack Saw, Model 6A.
1—W & S #2A Turret Lathe.
1—AMERICAN 16 x 36" Engine Lathe.
1—REED PRENTISS 16 x 60" Engine Lathe, QCG, Motor in Base.
1—PUTNAM Engine Lathe, 22" x 96" w/20" 4-jaw chuck.
1—GOULD & EBERHARD Shaper, 20", w/12" Shaper Vise.
1—LELAND GIFFORD 14" Upright Drill.
1—GREENERD #5S Floor Arbor Press.
1—MARVEL #4B Power Hack Saw.
1—CIN. BICKFORD 3' Arm, 9" Column.
2—ROCKFORD 16 x 30" Lathes, QCG.
1—HENDY 16" x 8' Yoke Eng. Lathe.
1—VAN NORMAN #2 Duplex Mill.
1—BECKER #5C Vertical Mill.
1—L. O. FARQUHAR Open Side Planer, 18 x 46" Surface.
1—WOODWORTH & POWELL Model B-10 Planer, 21 x 72" Table.
1—FAY & SCOTT 24 x 60" Engine Lathe.
1—CINCINNATI #3S Horizontal Milling Machine, 16-speeds, 15—375.
1—HENDY 16 & 36" Engine Lathe.
1—AMERICAN Radial Drill, 4'10" Arm x 57" Col. Quick Change, 8-speeds.
1—SOUTH BEND 9 x 36" Lathe.

PATTERN ROOM EQUIPMENT
1—J. A. EGAN 20" Planer.
1—WHITNEY Model 32 Single Spindle Wood Planer, 30".
1—Wood Turning Lathe, 16" x 6'.
1—S.A. WOODS Model #184 Wood Band Saw, 36" Throat.
1—CRESCENT 12" Wood Joiner.

MATERIAL HANDLING EQUIPMENT

Electric Clamshell Buckets
3—SHEPARD Model B-10, w/10,000# cap. Electric Hoist, 1½ & 2 yd. cap.

Electric Magnets
1—O. S. WALKER Model 48, 48" square Lifting Magnet, 5-ton cap., 220 Volt DC. (New 1958).
1—Elec. 30" Magnet—Crane Type.

Electric Fork Lift Trucks
5—CLARK Model 4024 Electric Carloader, 5000# cap. Telescopic 60" lift.
2—CLARK Model 4015 Electric Carloaders, 4000#, 60" lift. New 1948.
1—CLARK Model 2024, Electric Clipper. Telescopic, 36" Fork, 60" Lift.
1—YALE Model K23E-6 Electric Platform Truck, 6000# cap. 55 x 27" Platform.

Walking Fork Lift Trucks
4—AUTOMATIC TRANSPORTER Model SCLT-42 Stackers, 48" lift, 2350# cap.
1—LIFT TRUCKS INC. 48" Fork Electric push-button Travel, Hand Hyd. Lift Stacker, 2350# cap.
1—MONOTRUCK Automatic Stacker, 36" Fork, 58" lift, 4000# cap.
1—AUTOMATIC TRANSPORTER Electric 27 x 60" Platform, 4000# cap.
1—YALE & TOWNE Model M4DP27-48 4000# cap. 48" Fork, 6" lift.

Manual Lift Trucks
18—Y-T and L.S. hyd. lift, manual oper., 36, 42 & 48" L forks, by 27" W., 4000# cap. New 1950.

Misc. Gas & Elec. Powered Equip
1—OLIVER Straight Line Loader, "Gasoline Driven" Snow Loader.
1—CLARKETTE Towing Tractor, w/Power Brush & Snow Sweeping Attachment.
1—WAGNER Scoop-Mobile, 3000# cap. Gasoline Snow Loader. New 1946.
8—YALE & BARRETT towing tractors.
1—BUDA Chore Boy, 2000# cap., Platform Body, Gasoline Driven.
2—STEUBEN Pallet Movers, Electric.

MOLDING MACHINES
1—HERMAN 6000# Series Jolt Rollover Pattern Draw Machine, w/40 x 58" Plain Jolt Machine, w/Air Clamps.
1—TABOR 40 x 44" Plain Jolt Bumper Machine, 15" dia. cyl.
27—TABOR 10" Cyl. Jolt Squeezers, Yoke type, 18 x 18" Table.
1—ARCADE Model 221 Jolt Rollover Pattern Draw, 14 x 36" Table, Portable.

MOLD CAR CONVEYORS
1—LINK-BELT, 160 cars, made up in 4 loops. Car tops 19 x 41", 550' of Track & Chain. Automatic Dumping, w/Cooling Tunnel.
1—PALMER BEE, 74 cars, 16 x 69", 800' of Track & Chain, Automatic Dumping, w/Cooling Tunnel.

OVERHEAD CHAIN CONVEYORS
1000' #458 Chain Conveyor, w/PALMER-BEE #441 4"-Trolleys on 2' Centers, w/20 x 30" Trays on 4' Centers.

STEEL APRON CONVEYOR
1—NATIONAL 36" wide x 150' C to C x 9" high pans. Leak Proof.

SHAKEOUTS & VIBRATING CONVEYORS
1—SIMPLICITY 4 x 10' Model BG.
2—SYNTRON Model F-45 Vibrating Feeders, 30" wide x 84" long.
1—SIMPLICITY Model JA2 Vibrating Pan Feeder, 2 x 6' length.

SAND BLAST EQUIPMENT
1—AMERICAN WHEELABRATOR 36 x 42" Tumblast w/Skip Hoist Loader.
1—PANGBORN type NF-55 Sand Blast Room, 12' W x 12' L x 7'6" H.
1—PANGBORN type NF-40 Sand Blast Room, 9'6" W x 15' L x 7'6" H.

SAND MULLERS
2—SIMPSON #3 UD 8' dia., w/Dust Hood, Batch Hopper, Air Discharge, 40 HP Motor, Automatic Cycle, 3000# Batch Cap.
1—SIMPSON #3 Style C Sand Muller, 8' pan dia., Open gear, w/40 HP Motor.
1—NATIONAL #3 Aerator for Muller.
1—NATIONAL #3 Straight Lift Bucket Loader, Skip Hoist Type.

WHIRL-AIR FLOW (1957)
1—WHIRL-AIR FLOW #300, 30 cu. ft. cap. Transformer.
2—WHIRL-AIR FLOW 2-way Transfer Switches.
3—WHIRL-AIR FLOW Sand Receivers 36" dia., 24" high. Approx. 360 lineal ft. 4" extra strong Seamless Pipe.
4—WHIRL-AIR FLOW Booster Fittings to supplement Transporter.
2—Station Transporter Controls.
1—Control to Shut the Feeder off when Batch capacity reached.
1—SIMPLICITY 24" wide x 6' length Model JA Feeder.
1—Track Hopper.

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AIR COMPRESSORS

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BLOWERS

25—CENTRIFUGAL 16 oz., 2 to 5 HP
10—GE, WILBRAHAM - GREEN, FISHER Positive Pressure & Cent, Cupola Blowers

CLEANING EQUIPMENT & TUMBLING BARRELS

1—PANGBORN TABLAST, 8' Table, 2500#
1—SLY, Twin Unit, 40" x 24" Round, 10 HP
1—SLY, 68" x 32" Round
4—SLY, 48" x 36" Round
1—36" x 42" WHEELABRATOR Tumblast
1—48" x 42" WHEELABRATOR Tumblast,
1—15" x 20" WHEELABRATOR Tumblast
1—20" x 27" WHEELABRATOR Tumblast
2—27" x 36" WHEELABRATOR Tumblast, one rubber belt, one steel conveyor
1—48" WHEELABRATOR Swing Table
2—1-A WHEELABRATOR Multi-table with 6—26" aux. tables, 10—15" aux. tables

CONVEYORS

1—JEFFREY Car Type Mold, 23 cars, 109' track, cars 34" x 50"
1—HEWITT-ROBBINS Vibrating, 18" W x 10' L, Model VC-I
1—JEFFREY Ingot Mold, 3 compartment type 60' centers
1—LINK-BELT, CAR type mold, 114 cars, 403' track, car size 18" x 42"
1—SIMPLICITY, 24" x 10" Feeder w/hopper, Model OA-10-JA2

CORE BLOWERS

10—DEMMLER #1, #2, #2A, #3K, #4E
3—INTERNATIONAL SB-13
3—OSBORN #91, #192, #91-10
1—RANDALL MODEL "A," Bench Type
1—TACCONE #4D, 10" Draw Stroke Cyl.

CUPOLAS

1—SKIP CHARGER for #9 Cupola with scale and buckets
1—WHITING Skip Charger for #5 Cupola
2—WHITING #7, 7 ton cap. Never used. Fraction of cost!

DUST COLLECTORS

10—ROTOCLONE #12 Type N, #14D, #16W, #20D, #24W, #30W

FURNACES—DIRECT ARC MELTING

1—250 lb. LECTROMELT, Side Charge
1—2000 lb. HEROULT 3/60, 800 KVA
1—1½ Ton HEROULT
1—3 Ton LECTROMELT, Door Charge
1—3 Ton SWINDELL Hyd. Top Charge, 3000 KVA Transformer, Latest Type

FURNACES—INDIRECT ARC

1—350# DETROIT LFA
1—750# DETROIT LFY, Conical Shell
1—1000# DETROIT AA, 300 KVA
1—3000# Detroit C, 500 KVA

FURNACES—INDUCTION MELTING

1—3 KW, AJAX Lab type, steel
1—35 KVA, AJAX SPARK GAP, High Freq., steel
1—75 KVA AJAX, 2000# Brass
1—50 KW GECO, Steel

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BEARDSLEY & PIPER

#70 Speedmuller

15 cu. ft. batch with Cooling and Skip Loader

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1—400# FISHER MNP, Gas Fired, Alum.
1—STROMAN, Gas, 1000# cap. Alum., auto. control hyd. tilt.
1—STROMAN, Gas, 600 lb, "U" Type
1—1200# Brass, MNP, Oil

FURNACES—HEAT TREAT

1—2' x 3' x 6', gas fired, 1800° F.
1—4' x 4' x 10' Gas Fired Annealing
1—9' x 12' Car Type, gas/oil
1—20" x 36" L&N Draw electric
1—32" x 78" L&N Vapocarb, 83 KW
1—10" x 24" x 60" Gas, double end doors

MOLDING MACHINES

Jolt Rollover Pattern Draw

2—J & J #815RB, 30" x 40" table, 1200#
1—HERMAN 10,000#, 48" x 109" table
1—HERMAN 6000#, 42" x 78"
1—HERMAN 3000#, 30" x 66" table
5—HERMAN 1500# to 30" x 48" tables
3—HERMAN 750# to 30" x 36" tables
2—INTERNATIONAL, 13" x 17" tables
1—J & J #1020, 50" x 60" table, 20" draw
1—OSBORN #602, 36" x 26", 900#
1—OSBORN #405, 3000#, flask size 64" x 57", 26" draw
1—OSBORN #42, 15" x 20", hand draw
4—TABOR 40" x 60", 1500 & 3000# capacity
2—TABOR 30" x 40" w/air clamps, 1000#
1—TABOR 22" x 42", pattern draw, shockless, portable, 600#
1—TABOR 20" x 30", w/air clamps, 1000#
2—TABOR 14" x 16" Rockover, 150#

Plain Jolt

2—DAVENPORT, table sizes 24" x 27", 30" x 30", 1200# to 1800#
1—INTERNATIONAL, 3' x 4' table, 12" cylinder

Jolt Pin Lift

1—HERMAN #4317, 22" x 30" table
1—J & J #681-C, 30" x 25" table, 600#
1—MILWAUKEE #1536, 32" x 38", 1500#
1—OSBORN #559, 25" x 30" table, 6" draw, 1200#
2—SPO #305, 750 lb
1—TABOR 17" x 20" table, portable
1—TABOR 20" x 24" table, 600#

Jolt Squeeze Pin Lift

2—INTERNATIONAL PKL, 18" x 24" table, 12" sq., 5½" draw, stat.
1—MILWAUKEE #126, 21" x 27" table, 12" sq., 1200#, 8" draw
2—MILWAUKEE #163, 15" x 24" table, 11" sq., 1500#
2—MILWAUKEE #165, 24" x 30" table, 16" squeeze, 1700#
5—OSBORN #712J, #712PJ, 18" x 28" table, 12" sq., 6" draw, stat. & port.
5—SPO #2114P, 21" x 27" table, 600#
5—SPO #2136G, 21" x 30" table, 800#

Jolt Squeezers

2—INTERNATIONAL #12 LJS, 16" x 20" table
4—INTERNATIONAL #10 LJS, 16" x 20"
1—NICHOLS #12 F-P, portable, 600#
31—OSBORN #275PJ, #275J, 17" x 20" tables, 10" sq., 400#, stat. & port.
1—OSBORN #276J, 17" x 26" table, 13" squeeze, 500# port.
2—SPO #110J, 17" x 20" table port.
1—SPO #113 J, 18½" x 26" table, 13" cyl., port.

MATERIALS HANDLING

1—BYERS, Mobile Crane, BUDA Engine, 50' Boom, 5 ton w/magnet & bucket
1—HOUGH PAYLOADER, Model HA, 1000# cap., hyd. lift, mech. dump

MULLERS AND MIXERS

1—B & P #70 Speedmullor, 15 cu ft batch with cooling and skip loader
1—B & P, Conventional, SIMPSON type, 87½" Dia. arranged for cooling
1—CLEARFIELD #404, 4' Dia, 4 cu ft batch
5—SIMPSON #0, U.D. 3' Dia, never used
1—SIMPSON #1, U.D., 4' dia., 4 cu. ft. batch
1—SIMPSON #2, 6' U.D. Dia, 14 cu ft batch
1—SIMPSON #3, 8' Dia. Open Gear, 20-25 cu ft batch

LADLES AND POURING DEVICES

Bottom Pour

2—MODERN Crane Type, 55" H x 50" top
1—MODERN Crane Type, 60" H x 60" top

Lip Pour

2—MODERN 20½" x 20½", covered, enclosed gear
1—WHITING 40" x 40" top dia. geared
1—WHITING 36" x 36", enclosed gearing

Cylindrical

8—WHITING, 26" L x 25" dia, 1100# iron
7—WHITING, 19" L x 22" dia, 600# iron
3—WHITING, 38" L x 28" dia, 2200# iron

Pouring Devices

11—WHITING, 650# to 2000# gross cap.

OVENS

1—COLEMAN Oil, 1 compartment, 14'6" L x 80" H x 5' W
1—COLEMAN, Oil, Drawer Type, 70" L x 57" H x 48" W
1—COLEMAN, Gas, 2 Comp. and 5 drawers, O.D. 22" x 12' x 10'
1—COLEMAN, Gas, 2 compartments, rack type, each compartment: 7' H x 8' W x 10' D
1—GENRICH, Elec., 3 drawer, preheating, auto-control, 9' H x 8' W x 6'7" L
1—GENRICH Electric, Rack Type, 7' W x 7' H x 5'3" L
1—PORBECK, oil, 5 drawer core oven
2—ROSS, Gas, 2 compartment, recirc., rack type, 6½' x 14' x 7'

SAND CONDITIONING

2—B & P Screenarator, Model "S" & "M"
1—JEFFREY Sand'tioner, Portable, 10-15 tons/hour, 2 H.P. Motor
1—LINK-BELT Revivifier
2—ROYER, NC-2, 10-15 tons/hr, 1½ HP
1—ROYER PREPARATOR, Comb. Model NDC, 25 ton/hr scrap removal, 8' x 8' hopper
1—B & P Nite-Gang
3—ROYERS, NDP, 15-25 tons/hr, 2 Hp

SAND CUTTERS

1—AMERICAN, 15 HP, 96/78 Reel
1—AMERICAN, 10 HP 48" Reel

SAND SLINGERS

1—B&P Stationary, Single Speed
2—B&P Tractor Type, 16" head

SHAKEOUTS AND SCREENS

1—SIMPLICITY Vibrex screen, 3' x 8'
1—ROBINS Vibrating Screen, 36" x 78"
1—SIMPLICITY 50" x 116" shakeout

TESTING EQUIPMENT

1—500,000 lb. TINIUS OLSEN Hydraulic Compress'on Testing Machine
1—GOGAN Hand Operated Brinnel Hardness Tester

MISCELLANEOUS

1—HOWE WEIGHTOGRAPH SCALE, Model 1700
1—KANE & ROACH WIRE STRAIGHTENER, Model DX-5
FLASKS, CORE PLATES, All Sizes
1—CLIMAX Model 2-A Wire Straightener
10 or 15 HP GRINDERS, Swing Frame
8—GRINDERS, Double End, Pedestal Type, U. S., Cin., Gardner, 5, 7½ & 10 HP

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Circle 874 on Page 53

FOUNDRY LIQUIDATION

Formerly the Property of the Foundry Department of the Eberhard Mfg. Co., Cleveland

Consisting of two modern completely automatic molding systems, installed new in 1954. These two systems were used together with common sand hopper, elevator, shakeout, pan conveyor and air cooler; but can be sold separately. Each unit consists of the following:

Completely automatic molding system consisting of hoppers, Simpson 2F muller, Aerator, Cooling Hood, Charging Hoppers, Molders Hoppers, Spill Grate Hoppers, 8" Ajax Lo-Veyor, 12" Ajax Lo-Veyor, 36" Ajax Lo-Veyor, Hydro Filter, 4522 Molding Machine 4 Station, HA 500 Roll-Off Conveyor, HA 510 Drag Rockover, HA 520 Cope Conveyor Platform, HA 530 Drag Core Platform, HA 540 Closing Machine, HA 550 Closing Machine Push Out Cylinder, HA 560 Shuttle Transfer Machine, HA 570 Pour Platform, HA 580 Cooling Conveyor, HA 590 Mold Lift Machine, HA 600 Mold Transfer Machine, HA 610 Core-Strip-Drag Rockover Machine, HA 620 Automatic Shakeout Machine, HA 630 Drag Turn Machine, HA 640 Cope Turn Lift Machine, HA 650 Roll-On Conveyor, Cooling Conveyor, Osborn Drag Rockover, Cope Shakeout, etc.

Additional Equipment in Plant Consisting of:

5' x 12' Simplicity Screen
24" Magnetic Conveyor, Length 18'
Bucket Elevator 61' Centers, Buckets 16" x 8"
Sand Storage Bin 4500 Cu. Ft.
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Syntron Conveyor 24" x 60"
National Hydro-Filter Model HF 22, Cooling Unit
Ajax Lo-Veyor 24"
Whiting 7½ Ton, Overhead Crane, 50' Span, A. C., Cab Operated-Runways partially Covered.
Electric Clam Shell, 1½ Yard Capacity, D. C.
2 Cupolas, No. 7, with Swivel Skip Hoist, Scales, Blowers & Suppressors
Bondactor #1000
American Tumblast 27 x 36 with Skip Loader
Coleman Tower Core Oven, 36' High, Carriers 24" x 90", 3 Racks to each Carrier
Ingersoll-Rand Air Compressor Model XRE-9¼x12—15x12, with 100HP Motor—3/60/440 and Excitor
Ingersoll-Rand Air Compressor Model XRE, Imperial 10, 11x14—18x14, with 175 HP Motor 3/60/440 and Excitor
Ingersoll-Rand Air Compressor Model 30—3 x 1¾x2¾—2 HP 3/60/220/440
Towmotor LT 48, 108" Lift, 4000 Capacity
American Dust Collectors
Parsons Dust Collectors
Hough Payloader Model HA
7 Annealing Furnaces with Blowers
9 SPO Jolt Squeeers, Model 113
11 Osborn Jolt Squeezers, Model 275J
International Jolt Pin Lift, Model JDP
Osborn Jolt Stripper, Model 559
Magnet 55"
3 Demmler Core Blowers, Model 50
Demmler Core Blower, Model 2
Clearfield Muller No. 404
American Sand Cutter, Model M
Redford, Bench Type Core Blower
Pivot Type Belt Conveyor
Bucket Elevators
Air Receivers
Overhead Chain Conveyor, No. 458 Chain & Trolleys with Drive Unit
Ladles, Cylindrical and Tapered
Electric Hoists
Air Hoists
Core Plates, Transite & Asbestos
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Barrel Type Casting Cans with Trunnions
Misc. Parts and Supplies
Roller Conveyor

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Circle 875 on Page 53

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1—AMERICAN Size 9 x 9, horiz. w/30 hp.
1—KELLOG Model 350TV—5½ x 5", air cooled, 10 HP.

AIR & ELECTRIC HOISTS

85—I & R Air Motor type, sizes LC3, A, B, C, D, D-6 & E, 300, ½, 1, 2, 3 & 5 ton.
15—DETROIT Air Hoists, 1, 1½, 5ton cap.
2—P&H and DETROIT Model LHR, 5 ton.
20—THOR air hoists, ½, 1 & 2 ton cap.
1—SHAW BOX 2 ton load lifter.

BUCKET ELEVATORS

12—LINK-BELT & JEFFREY, 30, 40 50, 60 ft. cc, 10 x 7, 12 x 7, 14 x 7, 16 x 8 buckets.

CUT-OFF MACHINES

2—AMERICAN H-Rod Straighteners.
1—TABOR C10AF, 16" wheel, 10 HP.
3—TESSEMER H & I Sprue Cutters.

CORE BLOWERS

3—CHAMPION Model CB-10, CB-18, & CB-400. From 10 to 300 lb. Cores.
22—DEMMLER Model 1, 1E, 2, 2E, 2K, 3, 3E, 3K, 4 & 4E, 10 to 100 lb. Cores.
1—FEDERAL 40P-1 San-Blo.
7—INTERNATIONAL Model SB-11 & SB-13, SB-15H, 15 to 30 lb. Cores.
6—OSBORN Nos. 91, 92, 192 and 193. From 10 lb. to 75 lb. Cores.
3—MILWAUKEE #3A Bench Type.
1—SAN-BLO Model CB-40-B. 40# Cores.
1—SPO Model SC-10-DM, hollow core.

CORE OVENS

1—INDUSTRIAL "Revolving Carriers" continuous, 18" x 80" trays.
1—THERMONIC Model M800A Dielectric. Cap. 900#s per hour.

CUPOLAS, BLOWERS & EQUIP.

1—SPENCER 150 HP 7500 CFM 48 oz.
6—I & R Centrifugal 30, 50, 85 and 100 HP. 3500 to 10,500 CFM w/blast gates.
1—MODERN No. 3½ Cupola.
1—CUPOLA Bondactor, style 1205-L.
1—WHITING No. 6 Cupola.

ROTO-CLONES WET TYPE

9—AMERICAN AIR FILTER Type N&W, Sizes No. 20, 24, 27, & No. 30, w/sludge ejectors, cap. to 30,000 CFM.

ELECTRIC MELTING FURNACES

1—TOCCO 20 KW Induction, 9600 cycles.
3—AJAX No. 100 & 300 Furnaces Only.
1—DETROIT Size CM — 4000# Cold Charge, 8000# Molten Metal, w/1000 KVA transformer.
1—DETROIT AA, 750# Cold Charge, 1500# molten w/400 KW transformer.
1—AJAX 50KW M.G. Set w/Furnaces—3000 cycle.
2—AJAX 20 KW Hi Frequency Converters.
1—TOCCO 75KW M.G. Set—9600 cycles.

GAS & OIL FIRED FURNACES

23—LINDBERG FISHER Model MNP electric Tilt. Sizes 150, 400, 600, 1000, 1700, 2000 & 2400#, alum. cap. Gas or Oil.
29—LINDBERG & HAUSFELD Stationary, Sizes 100, 150, 200 & 550 cap.
1—LINDBERG #400 BBI hand tilt.
1—LINDBERG #300, ATH, hand tilt.
1—SKLEENAR 1200# Rev., hand tilt.
1—MONARCH 600# Rev., hand tilt.
1—STROMAN, Model "U" 600# Reverberatory Hand Tilt.
1—STROMAN DC "Dipout" 800# cap.
1—ECLIPSE E1000—Double Chamber Dry Hearth 1000# cap.

HEAT TREAT FURNACES

Complete line of used and rebuilt furnaces—gas, electric and induction, box pit-type, conveyorized, carburizing, nitriding, drawing, etc. Send us your requirements.

GRINDERS

Swing Frame

1—MARSCHKE 20" x 10" wheel, 10 HP.
2—FOX No. 6, 24" x 10", 15 HP.
3—MARSCHKE 24" x 3" wheel, 15 HP.
2—U. S. ELEC. Model 24, wheel 24" x 3".
1—MUMMERT-DIXON #2420, wheel 24" x 3".

Snagging

2—U. S. #64, 20" x 3", 7½ HP, 4 speed.
2—SAFETY #174, 24" x 3" wheel, 10 HP.
2—MARSCHKE 24" x 4" wheel, 20 HP.
1—U. S. #65, 30" x 3", 30 HP, 4 speed.
3—U. S. No. 62VS, 24" wheel, 2-7½ HP motor, variable speed.

Core

2—MILWAUKEE 70-12, 70" dia. table.
1—STONEY Core Grinder, 16" dia. Wheel.

Horizontal Disc

GARDNER No. 124—53" wheel, 20 HP.
GARDNER No. 179, 70" dia. wheel, 40 HP.

LADLES

17—MODERN & WHITING Cylindrical Ladles, 275, 1500, 2450, & 3000 lbs. capacity, All Enclosed Gears.
37—MODERN & WHITING Lip Pour, Enclosed Gear, 1200, 1600, 2000, 4000, 6000, 7000, 8000 lbs. capacity.
7—MODERN & WHITING Mixing Ladles, 2 & 3 ton. Electric & Manual Tilting.

NATIONAL ENGINEERING CO.

2-ton sand reclamation system used to reclaim old sand to a new supply. Operated pneumatically with turbine-blower. In use 2 years. Can be inspected. Still installed.

MOLDING MACHINES

Jolt Squeezers

37—OSBORN, SPO, MILWAUKEE, Portable & Stationary. 10" Squeeze Cyl.
13—OSBORN, MILWAUKEE & SPO Portable & Stationary, 12" Cylinder.

Plain Jolt

1—J&J 50 x 72 Table—5000# cap.
2—OSBORN 60" x 72" table, 6000# cap.
1—TABOR 36" x 36" table, 1000# cap.

Jolt Rollover Pattern Draw

1—DAVENPORT 28A, 28" x 44" table.
1—DAVENPORT 28-8A, 29" x 40" table.
1—DAVENPORT #24SA, 24" x 40" table.
3—HERMAN 1500 lb. Series, 26" x 48".
1—HERMAN 750 lb. Series, 20" x 30".
2—HERMAN 4000 lb. Series, 40" x 60".
14—INTERNATIONAL TYPE G, Sizes 20" x 8", 24" x 10", and 30" x 8".
2—J&J #612, 24" x 30" Table.
4—J&J #918, 44" x 54" Table.
1—J&J #815-B, 30" x 40" Table.
1—MILWAUKEE #167, 32" x 33" Table.
10—OSBORN #40 and 42 Core Rollovers.
1—OSBORN #442, 21" x 31" Table.
2—OSBORN #242W, 29" x 42" Table.
12—OSBORN #601 & 602, 30" & 36" Wide Flask, 10" draw, 750 lbs Cap.
2—OSBORN 643 Table 35" x 50"—2000#.
1—SPO #413D, 24" x 25" Table.
1—SPO Model 508, table size 28" x 30".
1—SPO 506—24" x 30" Table 10" Draw.
1—SPO 5050, Table 25" x 30", 10" draw
3—TABOR 30" x 40" Table, 12" Draw.
4—TABOR 22" x 42" table, 10" Draw.

Jolt Pin Lift

1—DAVENPORT 34AJS, 34" x 48" Table.
3—INTERNATIONAL JDP 1600 x 10" draw, 36" x 36" Table.
2—J & J No. 688, 25 x 30 Table.
2—OSBORN #559, 25" x 30" Table.
2—MILWAUKEE #2542, 38" x 42" Table.
1—SPO #3058, 22" x 28" Table.
2—SPO #3070, Table 28" x 35".
1—TABOR, 22" x 32" table.

Pin Lift

2—B & P Model AL 2428 Speed Draw.
1—MILWAUKEE #620 ND Power Push Off.

Jolt Squeeze Pin Lift

1—MILWAUKEE #125, 21" x 27" Table.
3—MILWAUKEE No. 165, 24" x 30" table.
3—MILWAUKEE #196, 17" x 38" Table.
1—OSBORN #712-V, 18" x 26" Table.
2—OSBORN #710-J, 17" x 21" Table.
9—OSBORN 714PJ, 20" x 31" Tables.
1—OSBORN 716PV, Table 22" x 34", 16" cyl.
4—INTERNATIONAL PKL, 17" x 26".
1—INTERNATIONAL PK-20, Size 20" x 8".
2—SPO 2192-R, 24" x 40" table, 19" cyl.
2—SPO 2114P, Table 21" x 27", 11" cyl.
2—SPO 2160-R, Table 24" x 30", 16" cyl.

Shell Molding

1—SHALCO, Model HO4, 2 station.

CONVEYORS

Steel Apron

9—JEFFREY & LINK-BELT 24", 30", 36", widths. Lengths built to your specifications, with reducers & motors.

Oscillating & Vibrating

1—LINK-BELT 48" x 154', 20 HP Motor.
7—JEFFREY TAYLOR No. 5 Vibrating Feeders 24" wide x 7'.
LINK-BELT "FLEXMOUNT"
1—8" W x 50' L x 4" deep pan
1—12" W x 21' L x 4" deep pan
1—12" W x 28' L x 4" deep pan
2—18" W x 18' L x 4" deep pan

Roller

2500' MATHEWS 6", 12", 18" wide, 2 9/16" dia. roller, 1¼" hex shaft, 4" channel.
1500—MATHEWS 8" x 12" wide, 3⅛" dia. 1" hex shaft on 6" centers, 6" channel.

Mold

1—DUO-ROLL 88 Cars 20" x 48", 350' track, with automatic dumping.

Belt

LINK-BELT & JEFFREY 18", 24" & 30" wide. Flat or trough idlers, all Timken bearings. Built to your specifications. Can be equipped with molders hoppers & Ploughs.

HOPPERS & STORAGE BINS

7—NATIONAL & LINK-BELT Storage Bins, 60 to 150 tons cap.
1—NEWAYGO HS-7-GT, Handy Sandy.
42—MOLDERS Hoppers 1½ ton cap.

SAND MULLERS

1—B & P #60, Speed Muller, 12 cu ft.
2—B & P #70, Speed Mullers, 18 cu ft.
1—BESSER Paddle Type, 30 cu. ft.
1—CINCINNATI 24" muller.
2—CLEARFIELD No. 610 w/skip hoist loaders, 10 to 14 cu ft batch.
1—CLEARFIELD #404, 4 cu. ft. batch.
1—DRAVO-DOYLE 6 cu ft cap, Port.
1—LINK-BELT 48" x 8' Paddle Type.
1—PEKAY No. 160-1-24 Mixer Muller, single stage for 24" belt, 230 TPH.
1—SIMPSON No. 1H Style UD—500#.
1—SIMPSON #0, style C, 175 lb.
2—SIMPSON #2, Style C, 1500# w/loader.
3—SIMPSON #3, Style C, 3000 lb.
3—SIMPSON #3, Style UD, 3000 lb.
2—Mixer Muller, 6 cu ft paddle type.
1—LANCASTER No. EDG-4, 5 cu. ft.
1—LANCASTER #EA-4, 6 cu. ft. w/loader.
1—FEDERAL 4 cu ft "Whirl-Mix" Muller.

SAND PREPARATORS

2—NATIONAL #3 Style C Aerators.
6—B & P Screenerators, Models S, M & L.
8—ROYER Models, NC-4, NDS, NDP, NRS.
6—AMERICAN Sand Cutters, Model M, Sizes 79/60, 89/70, 99/80. All late.
4—AMERICAN Model AA and AM, 45" & 60" Cutting Blade.
1—AMERICAN "Sand Master," 102"/70" Cutting Blade—1952.
2—MOULDERS' FRIEND 50" & 60" Brush.
1—SIMPLICITY LP 2' x 3' screen.

SANDSLINGERS

1—B & P Motive Jr., 300 cu ft tank.
2—B & P Tractor Type 19" head & 16" head, 13' arms, Magnetic towers.
6—B & P Models DB Stationary Sand Slingers, 16", 19" and 22" heads with 20, 25, 40 and 50 HP motors. All late.
2—B & P Swing Type Slingers 19" head.
4—B & P 8 ton plate feeders.
2—B & P 35 ton capacity plate feeders.
6—B & P Tanks for speed slingers.

SHAKEOUTS & SCREENS

1—ALLIS-CHALMERS 5' x 8', portable.
2—LINK-BELT 5' x 10', 6 ton cap.
3—SIMPLICITY 4' x 6' Model B.
1—SIMPLICITY 4' x 8' Model D.
1—SIMPLICITY 4' x 10' Model D.
1—SIMPLICITY 5' x 8', Model D.
1—NATIONAL ENG. 5' x 8' Hex Screen.
1—HEWITT-ROBINS 36" x 78" Vibrex.
1—SIMPLICITY 4' x 10' Model B, Single deck sifter screen, 10 HP motors.
2—ROBBINS 3' x 4' JF6—2000#.
2—ROBBINS 3' x 5' JF6—2000#.
1—ROBBINS 6' x 10' JF11—20,000#.

SAND BLAST EQUIPMENT

2—AMERICAN 36" continuous Tumblasts
1—AMERICAN 20" x 27" w/dust collector.
1—AMERICAN 36" x 42", w/skip hoist.
2—AMERICAN 48" x 42", w/skip hoist.
1—AMERICAN 27" x 36", w/skip hoist.
1—AMERICAN 48" x 48".
1—AMERICAN 48" x 72". Tumblast w/loader.
1—AMERICAN No. 1-B Suction Cabinet.
1—AMERICAN #3 Tablast, 4—48" tables.
1—AMERICAN #1 Tablast 7-14" tables.
1—PANGBORN #45, type MT Sand Blast Room 10' L x 8' W x 6' H.
1—PANGBORN Model 6-LF, 6' diameter plain table with dust collector.
1—PANGBORN 6LG-14 Multi-Table w/dust collector.
1—PANGBORN, Model 14-GD5-507, blast barrel w/loader.

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THE ACME BARGAIN PAGE

AERATOR
NEWAYGO

AIR COMPRESSOR
CHICAGO PNEUMATIC DCE 24; 14½ x 17; 2 Stage
6 x 7 INGERSOLL-RAND

BELTING
29" x 180' 24" x 152'
24" x 263' 24" x 120'

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GE 10500 cfm., 20 oz., 85 hp., 220 V.
GE 7500 cfm., 20 oz., 89.6 hp., 220-440 V.
GE Centrifugal 6200 cfm., 24 oz., 58 hp. motor
NORTH AMERICAN 1050 cfm, 16 oz.
SPENCER 7350 cfm, 16 oz., 50 hp.
SPENCER 2850 cfm., 16 oz., 20 hp., 220-440 V.
SPENCER 2250 cfm., 16 oz., 15 hp., 220 V.
SPENCER 270 cfm., 8 oz., 3 hp., 220-440 V.

CLEANING EQUIPMENT
Model 4836V-B VAPOR BLAST

CONVEYOR OVERHEAD CHAIN
1700' JERVIS B. WEBB and LINK-BELT #678 with trolleys 36" centers. 2-5 hp. Variable speed caterpillar drives, & motor generator set, takeups and turns.

CONVEYOR
17' BARBER GREEN Bucket Conveyor
30" x 25' Magnetic Belt Conveyor w/drives, 2 hp., 220-440 V.

CORE BLOWERS
DEMMLER #2, 20# cores
DEMMLER #2K, 20# cores
REDFORD Bench types, horizontal or vertical clamping
CB15 55# cores, Universal blow plate
C.B. 10 up to 12# cores, 4½" draw
DEMMLER #4 up to 250# cores
FEDERAL "SAN-BLO" CB 40
INTERNATIONAL SB15H, up to 150# cores. Hydraulic clamp and draw
INTERNATIONAL SB 13, up to 60# cores
INTERNATIONAL SB 12, medium sized cores
INTERNATIONAL SB 11, medium sized cores
6—OSBORN 193 up to 50# cores
OSBORN 2035-2 large sized cores

CORE GRINDERS
5—MILWAUKEE 70-9 & 70-12s
1—OWOSSO DE1-303 42" table

CORE OVENS ELECTRIC
THERMONIC INDUCTION MODEL 1800A

CORE ROLLOVERS
INTERNATIONAL REDP Rollover 12" draw
B & P CR 20-10
SUTTER SP 500F

CRANES
P&H 3 TON Electric Traveling DC motors 50' span
270' Crane Runway and Supports
10 ton MILWAUKEE; 48' span, 220 V.

CUPOLA GUNS
1—BONDACTOR #1250
BONDACTOR #1000

DIE CASTING
2—LAKE ERIE 800 ton Aluminum 58" x 89" die plates; 9# shot

DUST COLLECTORS
PARSONS 40,000 cfm. cloth bag type

ELECTRIC MELTING FURNACES
SWINDELL 9' Dia. Top Charge cap. 3 ton steel 5 ton iron per hour, 3500 KVA 13800 volt transformer, complete in place

ELECTRIC MELTING FURNACES
SINGLE PHASE
1—DETROIT "LFA" 350# shell 13200 V.
1—DETROIT "LFC" 700# & 350# Tapered Shell 2300 V.

FLASK HOIST—ROLLER CONVEYOR
NATIONAL 24"; 8' long table

FURNACE TRANSFORMERS
1—"LECTROMELT" 800 KVA, 12000 V., 3 phase
1—WESTINGHOUSE 500 KVA, 11200 V., 3 phase
1—WESTINGHOUSE 2500 KVA, 13800 V., 3 phase

FURNACES NONFERROUS
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1—HEVI-DUTY HD-181-S Pot type, Electric
2—400# FISHER Gas Fired Tilting Furnaces
4—600# FISHER Gas Fired Tilting Furnaces
1—600# FISHER Gas Fired Stationary Furnace
FISHER RB100 Gas Fired Crucible
3—CAMPBELL HAUSFELD Gas Fired 625# brass hand tilt
1000# STROMAN DC double dipout w/complete controls

GRINDERS, SNAG
FOX 24" x 2" Single Wheel 10 hp.
1—HAMMOND 24" x 2" x 12" 7½ hp., 220 V.
HAMMOND WR-2, 2 speed, 30" x 3" wheel

GRINDERS, SWING FRAME
MARSCHKE 24" x 3" x 12" 20 hp., 220 V.
U.S. 24" x 3" x 12" 15 hp., 220-440 V.
2—MARSCHKE 3 hp., 12" wheel
1—B&D 7½ hp.

GRINDERS, MISC.
U.S. #70 Combination 20" disc and 20" x 3" x 1½" wheel

HEAT TREATING FURNACES
HOLDEN #202 Electrode Type, Bright hardening annealing 1850°
LINDBERG 48" x 48" x 72" Elec., 1250°, box type
BELLEVUE Gas Fired Annealing 20' x 48" x 18"
HAGAN Oil Fired Annealing 18'3" x 3'3" x 18" high

HOISTS
10 ton SHAW BOX electric hoist
4—INGERSOLL-RAND Air trolleys
1—500# INGERSOLL RAND LC-4
4—CLEVELAND 2000# Cab type hot metal carriers

LADLE MIXING
4000# Industrial, Insulated

MOLD BLOWER
TACCONE TD4 24" x 32" flask

MOLDING MACHINES JOLT SQUEEZE PIN LIFT
3—#165-6B MILWAUKEE table, 24" x 30"
2—OSBORN 712 PJ, 18" x 21" table
1—CHAMPION JSL10P 18" x 21" table 6" draw
2—#2114 G. SPO table, 26" x 27"—11" cyl.
2—OSBORN 712 PV

SPECIAL! FACTORY REBUILDING
8—MILWAUKEE 2646 Jolt Squeeze Strip rolloff — rolling molding machines 10" jolt cylinder; 1800# capacity, 26" Squeeze cylinder; 13" draw, Flask size 25¼" to 29" wide, 52" long. New 1951. WILL BE FACTORY REBUILT.

2—SPO 2302 Automatic Jolt Squeeze strip rollon, rolloff; NEW 1955

JOLT SQUEEZERS
2—INTERNATIONAL, LJS12 16" x 20" table
4—CHAMPION, JS10P 18" x 21" table
2—OSBORN 275PJ
MILWAUKEE 214—Jolt Squeeze car type
2—MILWAUKEE 244 Jolt Squeeze car type head

JOLT ROLLOVER DRAWS
1020 JOHNSTON & JENNINGS, 60" x 56" table
JOHNSTON & JENNINGS 918, 44" x 64" table, 20" draw, rollout table
1—1500# HERMAN 26" x 48"
2—750# HERMAN 20" x 30" table
1—INTERNATIONAL RJ 20" x 12"
3—SPO 9032

JOLT PIN LIFTS
2—INTERNATIONAL 1200-8 26" x 27" table, 8" draw

PIN LIFT PUSHOFF
CHAMPION 28" x 42" table
MILWAUKEE 620ND 20" x 24" table

MULLERS and MIXERS
2—#1 SIMPSON Mullers

SAND CUTTERS
1—ROYER MCZ-43

SAND SLINGERS
1—B&P Tractor, 19" heads
B&P 2 speed 40/25 hp. double belt

SAND SYSTEMS
2—NEWAYGO SUPER HANDY SANDY; like new

SAWS, BAND
30" LAIDLAW, Metal Cutting hydraulic feed
42" TANNEWITZ, 5 hp., 220-440 V.

SAWS, CUTOFF
DELTA Abrasive cutoff

SCALE
FAIRBANKS PRINTOMATIC 6250#

SHAKEOUTS
3' x 5' ROBBINS
3' x 5' SIMPLICITY
5' x 6' SIMPLICITY
4' x 10' SIMPLICITY

SHOT BLAST
SLY #4, 20" x 20" w/dust collector

SPRUE CUTTERS
2—PERKINS #53 1¼" stroke
1—MILWAUKEE #85 TON

TESTING EQUIPMENT
ARLIN Automatic Rockwell, continuous type
COLEMAN 55 Spectrophotometer
TYLER ROTAP Testing Sieve w/screens

TUMBLING BARRELS
1—ROYERSFORD, 42" x 72", chain drive, late
WHITING 60" x 72" 20 hp. drive
SLY 42" x 42" x 64" 10 hp.

WHEELABRATORS
2—42" x 48" AMERICAN Skip Loaders
1—27" x 36" AMERICAN Skip Loader
AMERICAN #2 Tumblast 8-2b" tables, late
2—HOLLINGSWORTH 44" x 48" Wheelabrators

WOODWORKING—PATTERNSHOP
GARDNER 30" DISC and Spindle Sander
JONES SUPERIOR 48" Double Disc
OLIVER 72DR Router or borer
BOICE CRANE 12" Planer
2—OLIVER 182D, 15" Disc Sanders
1—WALLACE 8" Jointer
1—CRESCENT 24" Planer
TANNEWITZ 42" Band Saw
ONSRUD W-244 & W-240 Routers
GREENLEE #495-S Tilting Arbor Saw
8", 12" and 30" Jointers
16", 32", 36" Band Saws

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2—#2A CLIMAX ¼"

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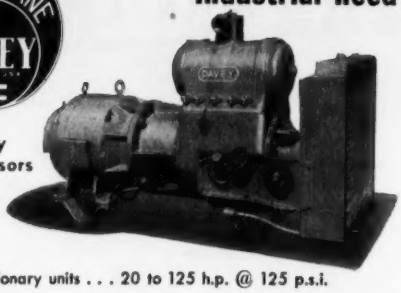

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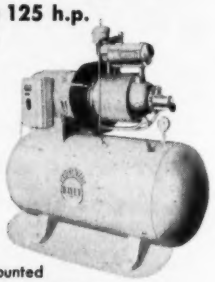

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FOUNDRY is indexed regularly by
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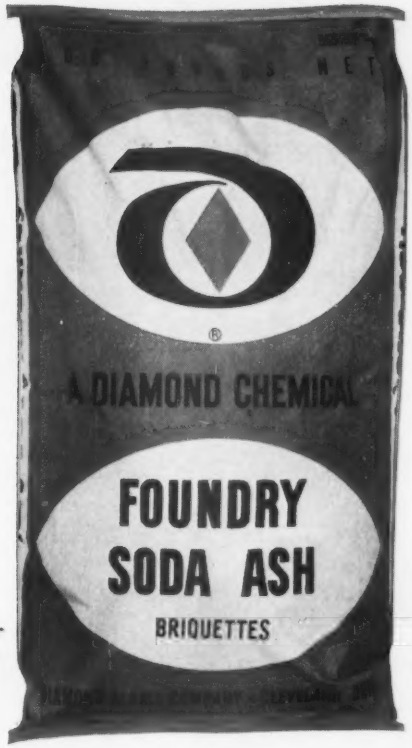

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No inactive ingredients to add to cost. Pillow shaped for easy handling and fast, efficient desulphurization of molten metal in cupola or ladle. Diamond Foundry Soda Ash Briquettes permit greater use of scrap metal in melting, release entrapped gases and increase fluidity. Tough, moisture-proof 100-lb. bags keep them dry, effective and safer to use.

For prompt shipment and technical assistance,
call your nearest Diamond sales office.
Diamond Alkali Company, Cleveland 14, Ohio

4701 Paddock Cincinnati, Ohio REdwood 1-3200	12 South 12th St. Philadelphia 7, Pa. WAlnut 5-8017	4246 Forest Park Blvd. St. Louis 8, Mo. JEfferson 5-2232
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633 Penton Bldg. Cleveland 13, Ohio SUperior 1-8683	1006 Main St. Houston 2, Texas FAirfax 3-7329	99 Park Avenue New York 16, N. Y. OXford 7-0440

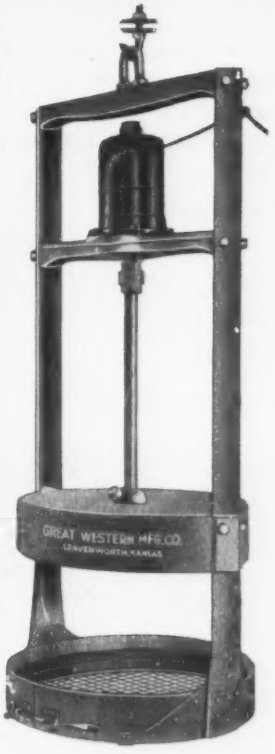
Diamond Chemicals

Circle 731 on Page 53

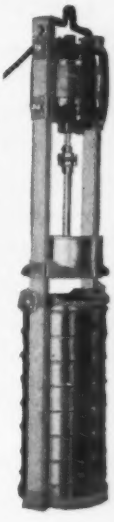
COMBS GYRATORY RIDDLES

Offers Years of Satisfactory Service

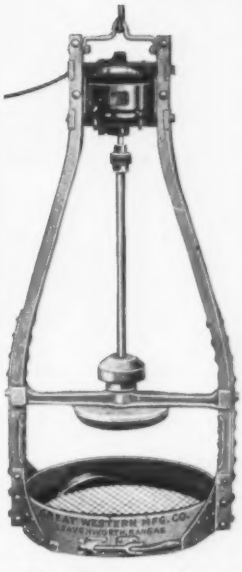
The Most Advanced Screening Machine on The Market



TYPE "CR". Complete price $385.00. 24" dia. round sieve. Sifts, fluffs, mixes, aerates sand. Height 4'6", weight 250 lbs., ⅓ H.P. enclosed motor.



TYPE "HL". Price $285.00 complete, less sieves. Laboratory model especially designed for laboratory sand control, fitted with 1/6 H.P. enclosed motor.



TYPE "V". Price, 20" Sieve, $300.00. Does the work of 10 men. Screens sand, Fine, Medium, and Coarse. 20" dia. sieve with special clamp for 5-second changes. Height 4'6", weight 100 lbs., fully-enclosed 1/6 H.P. motor. Also available in Giant V-5 with 36" sieve for triple capacity . . . Price $545.00.

TYPE "CS". Complete price $395.00. 24" square sieve. A continuous operation sieve. Requires no dumping, as refuse is ejected off to one side. Height 4'10", weight 295 lbs., ⅓ H.P. enclosed motor.

Prompt Delivery Through Your Foundry Supply House

GREAT WESTERN MFG. CO.

Leavenworth, Kansas **Phone MU-22291**

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MAIL THE COUPON NOW!

Circle 732 on Page 53

MODERN NEW ELECTRIC POURING!

Electrified pouring devices now are relieving many pour-off men from all lifting and load pushing. Whether your pouring progresses over synchronized conveyor lines (shown here) or on conventional pallets you can enjoy all these cost-cutting benefits;

- ***Less back-breaking work permits the operator to concentrate on faster more accurate pouring . . .***
- ***Fewer relief men are needed . . .***
- ***Higher tonnages are poured with less fatigue . . .***
- ***Chilling waste is nil . . .***
- ***Over-all quality of metal is higher . . .***
- ***Fewer accidents help to reduce insurance rates . . .***

Two sizes are available to handle *gross loads to 1275 pounds (as shown) and another with *gross load capacity to 2400 pounds. The electric pouring devices in operation here are handling 19" ladles and 400 pounds of molten metal. Complete information will be mailed on your request to MODERN EQUIPMENT COMPANY, Port Washington, Wisconsin.

Over-head traverse is synchronized with conveyor at Neenah Foundry Company. Tag-line may be substituted for conductor bars.

**GROSS LOAD is bail, complete ladle, lining and metal.*

Enlarged view of motor and gear section of new pouring device FAE — shown in operation here.

MODERN

MODERN EQUIPMENT CO., Dept. F-5, Port Washington, Wis.

- ☐ Mail bulletin on new, electric device . . . FAE-11-58
- ☐ Mail catalog on standard pouring devices and ladles . . . P-152-A
- ☐ Mail catalog on water-cooled cupolas and chargers . . . 147-C
- ☐ Ask representative to call.

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Circle 733 on Page 53

Nothing yet tried has been able to fuse Stevens Plumbago! Not even the hottest blowtorch.

GET YOUR FREE SAMPLE OF NEW STEVENS BLACK VELVET PLUMBAGO!

For more than 50 years, Stevens Plumbago has been the foundryman's favorite. Now there's a brand-new Stevens Plumbago on the market. It promises to be an even greater favorite . . . because it's made of finer materials than ever before – the finest in the world.

- Use it dry as a mold coating.
- Mix it with molasses water and use as a mold wash.
- Add it to core washes to increase heat resistance.
- Use it as an additive to sand to give a heat resistant coating to each grain.

Whichever way you use it, you can be sure that new Stevens Black Velvet Plumbago will definitely improve the quality of your castings.

Write on your letterhead for a free sample. Or ask your local Stevens representative.

frederic b. **STEVENS, inc.**

DETROIT 16, MICH.

BUFFALO CHICAGO DETROIT CLEVELAND
INDIANAPOLIS MILWAUKEE NEW HAVEN SPRINGFIELD (OHIO)

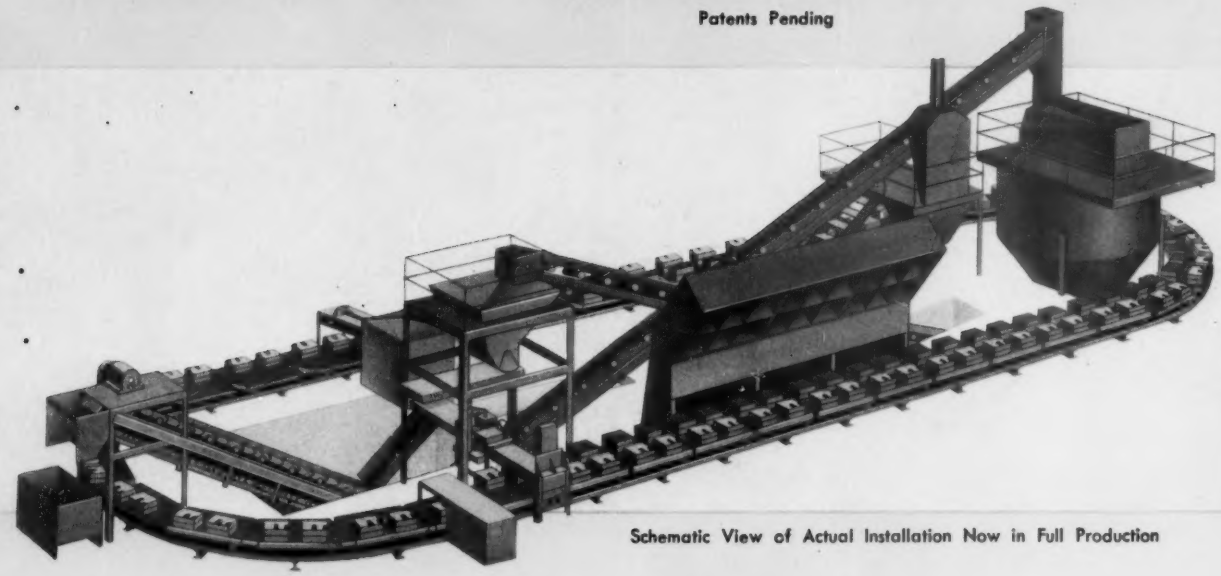
Circle 552 on Page 53

EVERYTHING FOR A FOUNDRY

NEW BARTLETT-SNOW CLEVELAND 5, OHIO

Double "M" MOLD CONVEYOR

Patents Pending



Schematic View of Actual Installation Now in Full Production

INCREASES OUTPUT . . . CUTS CASTING COSTS

many outstanding advantages

New type mold conveyor system . . . automatically transfers flasks 14" to 18" or larger, from outside position for pouring to inside position for shake-out . . . enables just one man operating a semi-automatic molding machine, and one man closing, to set out from 120 to 180 molds per hour . . . provides from 40 to 60 minutes of cooling time with a loop only 25 feet wide by 75 feet long . . . permits the automatic flask return, castings discharge conveyor, and completely automatic sand plant, to fit easily inside the loop, under building trusses only 15 feet high.

For more information about this new system, specially developed to increase production when floor area is limited—and other cost reducing ideas—call your nearest Bartlett-Snow office.

THE C. O. BARTLETT & SNOW COMPANY

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